

ARIZONA GAME AND FISH DEPARTMENT

PRONGHORN MANAGEMENT PLAN

In support of the Arizona Game and Fish Department's Operational Plans, the Department updates the pronghorn management plan every two years.

The following management plan describes how the Department will manage pronghorn in Arizona. The Commission will review the plan before implementation.

November 14, 2007

INTRODUCTION

In 2007, about 11,000 pronghorn were found in Arizona, chiefly in the north-central portion of the state with small, scattered herds of pronghorn in southeastern Arizona. The endangered Sonoran pronghorn are found in southwestern Arizona, but are not addressed in this document. This subspecies is addressed in a separate recovery plan for this federally endangered subspecies. Most of Arizona's pronghorn population is found between 3,000-7,000 feet elevation. Sometimes, northern herds occur as high as 10,000 feet during summer. This range in elevation encompasses a variety of grassland habitats ranging from desert grasslands to forest and mountain meadows. Pronghorn prefer flat, open grassland areas, but also use rolling or broken hills and mesa tops of less than 20 percent slope. They also use such diverse habitats as sparse deserts, woodlands, and open forests. Pronghorn home range estimates are quite large, and can vary from 20-40 mi².

The Department's statewide goal is to maintain pronghorn populations that provide diverse recreational opportunities for the public. Specific objectives for pronghorn management include an annual harvest of between 600 and 800 animals. We would like to provide recreational opportunity for 1,200 to 1,600 pronghorn hunters per year. These objectives are to be accomplished through several strategies identified in our wildlife management planning documents, including: *Wildlife 2012* Strategic Plan, operational plans, species management guidelines, and hunt guidelines.

This statewide management plan is designed to implement the statewide strategies by identifying issues and opportunities within individual pronghorn herds-units. This is designed to be a document that is reviewed and updated every two years.

The following regional segments address current and future perspectives in pronghorn management in Arizona. They serve to identify past and current pronghorn management issues, provide pronghorn population management objectives, as well as consider management opportunities to address issues on public and private lands.

Goal:

Develop the framework for pronghorn management and issue resolution consistent with the Department's *Wildlife 2012* Strategic Plan, operational plans, and the Species Management Guidelines. Use local Habitat Partnership Committees (HPC) to develop habitat enhancement projects, which are consistent with the committee's goal statement to increase habitat capability or address conflict resolution.

Future Management Needs:

Future population objectives will be set in consultation with land management agencies, HPCs, and interested public. These objectives will be consistent with approved planning documents such as the Department's *Wildlife 2012* Strategic Plan. Public input regarding pronghorn management will be documented every two years to keep each Regional segment current. These

plans will be reviewed and submitted with the pronghorn hunt recommendations to the Arizona Game and Fish Commission.

Pronghorn population modeling will be used in making pronghorn hunt recommendations along with improved survey techniques. Additional studies may be conducted to ensure the continued precision of population models and survey methods. Improved survey monitoring will be implemented as appropriate.

Population objectives can be further tailored for each herd unit by analyzing: total numbers surveyed during pre- and post-hunt surveys; standardizing aerial flights using Global Positioning System (GPS) technology; using observed pre-hunt fawn to doe ratios as an indicator of habitat quality and rate of recruitment; and tailoring forage monitoring to better determine what impacts are in key areas on a landscape level.

The HPCs should become an integral step in securing funding for on the ground habitat improvement projects. For sound population management decisions, active and broad-based local committee participation is essential.

Habitat improvement projects will continue to be coordinated with the HPCs to address concerns regarding pronghorn management. To date such projects have included water source maintenance and expansion, juniper pushes and removal, fence modification and removal, and prescribed burns.

Commission Direction:

Objectives:

The Department's Pronghorn Antelope Management Goal is to maintain pronghorn antelope populations at levels that provide diverse recreational opportunities.

Season prescriptions:

1. All pronghorn antelope permits will be for "buck only."
2. Pronghorn antelope hunts may be stratified. Fourteen-day archery seasons will begin on Friday of week 34 (August 22, 2008 and August 21, 2009). If an archery season must be stratified, the first 14-day season will begin on Friday of week 32 (August 8, 2008 and August 7, 2009), and the second 14-day season will begin on Friday of week 34 (August 22, 2008 and August 21, 2009). If firearm seasons are stratified, there will be a seven-day muzzleloader or general season beginning on Friday of week 36 (September 5, 2008 and September 4, 2009) and a seven-day muzzleloader or general season beginning on Friday of week 37 (September 12, 2008 and September 11, 2009). If the firearm season is not stratified, a ten-day season will begin on Friday of week 36 (September 5, 2008 and September 4, 2009). To the extent possible, harvest will be allocated to meet first-choice applicant demand among weapon types.

Opportunity prescriptions:

- A. Wildlife Managers will manage pronghorn for the center of guideline ranges, while keeping confidence intervals in mind. The most recent three year average in buck:doe ratios should receive greater emphasis than fawn:doe ratios when determining permit levels. The most recent three year trends in buck:doe and fawn:doe ratios will also be considered.
- B. If the population is within guidelines, permit numbers should reflect a desired harvest of 15 to 25% of the estimated number of available bucks in the population.

Guideline	Decrease	Stay the Same	Increase
Fawns:100 Does	< 30	30 to 40	> 40
Bucks:100 Does	< 20	20 to 30	> 30
Population Trend	Decreasing	Stable	Increasing

REGION I

Unit 1

History:

Pronghorn distribution and population densities in Unit 1 are seasonal. The largest areas of grassland habitat, which are occupied year round, are found between State Route 260 and US Highway 60, and north of Escudilla Mountain from the New Mexico State Line to US Highway 191. Summer ranges vary across the unit but include higher elevation grasslands found near Big Lake, Wahl Knoll, Crosby Crossing, Lee Valley, and the Greens Peak area. Pronghorn have also been observed in the mixed grassland and forest habitats at P.S. Ranch, Kettle Holes, along Black River and along Mineral Creek. A transplant population persists at Sipe Wildlife Area; however, marked animals from the initial releases have been observed in Units 2C and 27 and as far away as the Vernon area.

Population Information:

The pronghorn population in Unit 1 appears to have declined sharply from 2000 when 744 animals were observed during survey flights to 310 animals observed in 2007. Though the overall population trend is down, the largest decline during this period seems to have occurred between 2001 and 2002 when extreme drought conditions prevailed. Current information suggests that this trend has flattened considerably since then.

Recruitment continues to be low and the ratio of fawns:100 does has not been within or even near Department guidelines since 1997 when it was 30:100. Poor habitat conditions, which are exacerbated by drought and grazing regimes, and predation are likely the driving factors behind this low recruitment.

Specific Concerns:

The lower elevation grasslands between State Route 260 and US Highway 60 and north of Escudilla Mountain between New Mexico and US Highway 191 are used year round with increased densities during winter. Pinyon-juniper as well as some ponderosa pine encroachment has substantially altered and fragmented areas of this formerly contiguous grassland habitat. Fire suppression is likely the leading cause of this. Also, the loss of historic grassland components and functions such as the presence of cool season grass species and forbs and the historic fine fuel components to allow for the return of appropriate wildfire has negatively affected this habitat type. Timing, frequency, and intensity of livestock grazing is likely a factor and has also caused some areas to be left with very little residual cover for newborn fawns to hide in.

Though several miles of right-of-way fence have been modified for easier pronghorn passage, future increases in highway traffic may create increased barriers to pronghorn movement within the unit and Unit 2C. Additionally, potential migration corridors to higher elevation summer ranges may become unusable to pronghorn due to woody species encroachment.

Large portions of State Land within the unit may be susceptible to future development. This has recently begun to occur, though on a very small scale, between Springerville and Vernon.

Management Objectives:

- Continue coordination with the Arizona State Land Department and the U.S. Forest Service as well as the Springerville-Alpine HPC to implement large scale habitat improvement projects in the north part of the unit which would include thinning and prescribed burns.
- Continue to address pronghorn concerns when evaluating Allotment Management Plan revisions.
- Implement a research study to identify migration and travel corridors as well as possible barriers through use of GPS collars.
- Continue to modify right-of-way fencing along State Route 260 and ensure that any new fences or old fences being replaced along other highway right-of-ways are built to wildlife passable specifications.
- Protect pronghorn habitat from future development where possible.

Unit 2A

History:

Pronghorn distribution and population densities are relatively similar across Unit 2A, with the exception of the area north of Interstate 40, where pronghorn occur in minimal numbers.

Population Information:

According to the last winter survey (in 1996), the overall pronghorn density for this unit was 0.50 pronghorn/mi². The 2007 survey classified 60 bucks, 149 does, and 26 fawns for a population estimate of 510 pronghorn. The density (0.56/mi²) has stayed consistent with the 1996 density estimate.

Specific Concerns:

Numerous fences occur throughout the pronghorn range in Unit 2A. Most of the fences are older 4-wire fences, which normally allow for adequate wildlife movement. But there are a few fences that need to be modified to increase the movement of pronghorn through them. Interstate 40 and the Santa Fe Railroad cross the northern part of this unit. These two routes parallel each other, generally within a mile or so, and each has right-of-way fences. The interstate and railroad with the combined four fences is a very impervious barrier to pronghorn trying to move north or south.

All of the waters for pronghorn in this unit are either natural occurring (very limited) or water sources built for livestock operations (dirt tanks, windmills, water lines with drinkers, etc.). All are dependent on rainfall patterns and/or on maintenance of the systems by the livestock operators.

The rangeland within this unit is normally grazed year round, with some having livestock movement between pastures as needed and other pastures being heavily grazed. Range conditions vary greatly with rainfall pattern and associated livestock stocking rates. Excessive forage use is a concern in this unit.

During the 1960s, about 100 sections were subdivided within this unit. This would be about 7% of the unit and 14% of the private land within the unit. There is high turnover of residents with people moving in and out, associated fences being built and other fences falling down. However, these barriers still have a detrimental effect on the pronghorn. Within the last 5 to 10 years, about 60 sections have been subdivided. This approximates 11% of the unit and about 22% of the private land being subdivided. As more of the private land is sold off for subdivisions, a greater negative effect will be placed on the pronghorn population.

Management Objectives:

- Increase forage conditions in "moderate" and "low" quality habitats.
- Evaluate and improve wildlife water distribution.
- Develop cost share agreements with livestock operators to redevelop and enhance water systems.
- Coordinate with landowners and livestock operators to leave waters available to wildlife when livestock are absent.
- Work with new landowners on building wildlife friendly fences and evaluate and modify current livestock fences to pronghorn specifications.
- Greater use of controlled burning to restore grassland habitat and increase plant species diversity.
- Predator management to enhance fawn survival.
- Use Heritage funds to acquire key pronghorn habitat, providing for parcels of significant size to allow for enhanced management opportunities.

Unit 2B

History:

Pronghorn distribution and population densities are similar across Unit 2B. Aerial coyote control was conducted in portions of Unit 2B in 1995, 1996, and 1997. The five-year average fawn crop for 1990–1994 was 9 fawns:100 does. The fawn to does ratios for 1995, 1996, and 1997 were 28, 11 and 46 fawns:100 does respectively. However, the five-year average fawn recruitment rate for 1998 to 2002 declined to 14 fawns:100 does.

Population Information:

According to the last winter survey (1997), the overall pronghorn density for this unit was 0.81 pronghorn/mi². Surveys flown in 2007 classified 16 bucks, 105 does and 29 fawns for a population estimate of 347 pronghorn. The density (0.70 pronghorn/mi²) has stayed fairly consistent with the 1997 density estimate.

Specific Concerns:

Numerous fences occur throughout the pronghorn range in Unit 2B. Most of the fences are older 4-wire fences, which normally allow for adequate wildlife movement. But there are a few fences that need to be modified to increase the movement of pronghorn. Subdivision of large areas is increasing fence densities, and designs can impede or prevent pronghorn movements.

All of the waters for pronghorn in this unit are either natural occurring (very limited) or water sources built for livestock operations (dirt tanks, windmills, water lines with drinkers). All are

dependent on rainfall patterns and/or on maintenance of the systems by the livestock operators. Waters developed by ranchers and natural water sources would probably provide adequate water distribution, if all were available all of the time. However, with this many factors affecting the water distribution (i.e., various rainfall patterns, droughts, water sources shut down when livestock are moved or not present, manmade water sources not maintained), water availability could easily be a limiting factor in parts of the unit for pronghorn in some years. Critical waters for pronghorn have not been identified for this unit. Based on the factors listed above, the availability of water is always changing.

In many portions of Unit 2B, encroachment from pinyon and juniper trees is a concern. This encroachment is causing a loss of grassland habitat.

The rangeland within this unit is normally grazed year round, with some having some livestock movement between pastures as needed, other pastures being heavily grazed, and a small portion with livestock removed during the summer. Range conditions vary greatly with rainfall patterns and associated livestock stocking rates. There is concern with forage overuse, especially during droughts and prior to pronghorn fawning.

During the 1960s, about 20 sections were subdivided within this unit. This comprised about 2% of the unit and almost 6% of the private land within the unit. Within the last few years about 145 sections have been subdivided or are in the process of being subdivided. This is about 20% of the unit and about 47% of the private land being subdivided and converted from livestock grazing.

Another new threat to this population is the exploration and extraction of subterranean carbon dioxide gas. The gas is extracted through drilled wells and is transported by pipeline to oil fields to aid in oil recovery. Many wide roads have been and are being built. These roads facilitate vehicle access, reduce forage availability, and with the increased vehicle activity increase pronghorn disturbance.

Management Objectives:

- Increase forage conditions in "moderate" and "low" quality habitats.
- Evaluate and improve wildlife water distribution.
- Develop cost share agreements with livestock operators to redevelop and enhance water systems.
- Coordinate with landowners and livestock operators to leave waters available to wildlife when livestock are absent.
- Work with new landowners on building wildlife friendly fences and evaluate and modify current livestock fences to pronghorn specifications.
- Greater use of controlled burning to restore grassland habitat and increase plant species diversity.
- Predator management to enhance fawn survival.
- Remove pinyon and juniper trees as needed and as opportunities arise in and adjacent to occupied habitats.
- Use Heritage funds to acquire key pronghorn habitat, providing for parcels of significant size to allow for enhanced management opportunities.

Unit 2C

History:

Pronghorn distribution and population densities are similar throughout Unit 2C. In 1996 Research Branch published data on Unit 2C's pronghorn habitat suitability. This unit scored well with 125 mi² rated as moderate and 88 mi² rated as high quality habitat.

Population Information:

The only winter survey conducted in this unit (in 1991) indicated an overall pronghorn density of 1.2 pronghorn/mi². Surveys flown in 2007 classified 15 bucks, 129 does, and 29 fawns for a population estimate of 611 pronghorn. The density (2.04 pronghorn/mi²) has increased from the 1997 density estimate. Even with the increase in density, the buck:doe ratio continues to decline.

Specific Concerns:

Numerous fences occur throughout the pronghorn range in Unit 2C. Most of the fences are older 4-wire fences, which normally allow for adequate wildlife movement. But there are a few fences that need to be modified to increase the movement of pronghorn. Subdivision of large areas is increasing fence densities, and designs can impede or prevent pronghorn movements.

All of the waters for pronghorn in this unit are either natural occurring (very limited) or water sources built for livestock operations (dirt tanks, windmills, water lines with drinkers, etc.). All are dependent on rainfall patterns and/or on maintenance of the systems by the livestock operators. Waters developed by ranchers and natural water sources would probably provide adequate water distribution, if all were available all of the time. However, with this many factors affecting the water distribution (i.e., various rainfall patterns, droughts, water sources shut down when livestock are moved or not present, manmade water sources not maintained), water availability could easily be a limiting factor in parts of the unit for pronghorn in some years. Critical waters for pronghorn have not been identified for this unit. Based on the factors listed above, the availability of water is always changing.

During the 1960s, at least 14 sections were subdivided within this unit. This comprised about 4% of the unit and almost 11% of the private land within the unit. Most of these subdivisions are smaller lots than the subdivisions in Units 2A and 2B. Within the last few years about 28 sections have been subdivided or are in the process of being subdivided. This makes a total of 13% of the unit being subdivided and about 33% of the private land being used for residential purposes. Most of the development is on the west and southwest portions of the unit.

In the southwest portion of Unit 2C, encroachment from pinyon and juniper trees is a concern. This encroachment is causing a loss of grassland habitat.

Rangeland within this unit has mixed grazing practices, with some having livestock removed during the summer months, some with movement between pastures as needed, and other pastures being heavily grazed year around. Range conditions vary greatly with rainfall pattern and associated livestock stocking rates. There is concern with forage overuse, especially during droughts and prior to pronghorn fawning.

Management Objectives:

- Increase forage conditions in "moderate" and "low" quality habitats.
- Evaluate and improve wildlife water distribution.
- Develop cost share agreements with livestock operators to redevelop and enhance water systems.
- Coordinate with landowners and livestock operators to leave waters available to wildlife when livestock are absent.
- Work with new landowners on building wildlife friendly fences and evaluate and modify current livestock fences to pronghorn specifications.
- Greater use of controlled burning to restore grassland habitat and increase plant species diversity.
- Predator management to enhance fawn survival.
- Remove pinyon and juniper trees as needed and as opportunities arise in and adjacent to occupied habitats.
- Use Heritage funds to acquire key pronghorn habitat, providing for parcels of significant size to allow for enhanced management opportunities.

Unit 3A

History:

Pronghorn are distributed throughout undeveloped areas within Unit 3A. Pronghorn occupy Great Basin grasslands, plains grasslands, and open areas of Great Basin Conifer Woodlands within the unit. Seasonal variation in distribution is influenced primarily by rainfall patterns and livestock grazing which produce variations in the quality and quantity of available forage. There is no distinction between winter and summer ranges.

Pronghorn habitat in Unit 3A is comprised of private, State Trust, Bureau of Land Management (BLM), and U.S. Forest Service lands, with the majority of pronghorn habitat in the unit located on private land. The east half of the unit (that portion of the unit which lies east of State Route 77) is about 75% private land and the western half of the unit (west of State Route 77) is about 60% private land. In 1996, the Research Branch evaluated pronghorn habitat quality throughout the unit. The evaluation indicated the majority (50%) of pronghorn habitat in the unit was moderate quality, followed by 20% evaluated as low quality and 15% unsuitable.

Population Information:

Pronghorn density within the unit has fluctuated over the last 15-20 years, although population status derived from survey trends and animals observed per hour does not conclusively show that the population has either increased or decreased during this period. Like many of the surrounding units, annual fawn survival and recruitment are often fair to poor. Surveyed fawn:doe ratios in Unit 3A are frequently below the Department's guidelines (30-40 fawns: 100 does). However, a measurable increase to the unit's fawn:doe ratios and population index recently occurred after several years of good precipitation and the implementation of a three-year predator management (aerial coyote gunning) from 2003 to 2005. Due to this success another three years of aerial coyote gunning will be recommended beginning in 2008.

Specific Concerns:

Habitat loss and fragmentation from private land development is a primary concern in eastern Unit 3A. The east half of the unit has been inundated with residential developments; primarily 40 acre ranches. Development has occurred without provisions for easements and travel corridors for pronghorn. Development has not been as widespread on the west half of the unit. Though there is some development spreading north from Snowflake along the State Route 77 corridor and development planned southwest of Holbrook off State Route 377.

Forage conditions and plant diversity are a critical issue throughout the unit. Heavy livestock use coupled with frequent drought periods act to reduce the forb component during the growing season. Additionally, late season or winter season grazing could affect critical hiding cover for fawns in the summer.

Numerous fences occur throughout the pronghorn range in Unit 3A. Most of these fences need to be modified to be pronghorn passable. Fences and fenced highways, which surround (State Routes 277 and 377 and US Highway 180) and bisect (State Route 77) Unit 3A, were said to be the most pressing problem for pronghorn management in the unit by the 1996 “Statewide Evaluation Of Pronghorn Habitat in Arizona” (Ockenfels et. al.).

Management Objectives:

- Coordinate with land management agencies (USFS Black Mesa Ranger District, Safford BLM Field Office, and the Arizona State Land Department) and private landowners to insure key pronghorn habitat is identified and enhanced through pinyon-juniper removal, development of additional wildlife waters and other applicable management activities.
- Inventory and modify, where necessary, fences within the unit including right of way fencing along State Routes 77, 277, and 377 and US Highway 180. Ensure that any new fences being built or old fences being replaced are being built to wildlife passable specifications.
- Protect pronghorn habitat from future development where possible. Identify and protect travel corridors in areas where private land development is planned. In developed areas frequented by pronghorn, modify existing fences not built to wildlife standards to make the fences pronghorn passable.
- Implement another three-year predator control program (aerial coyote gunning) in the west side of the unit to improve fawn survival and recruitment.
- Use Heritage funds to acquire key pronghorn habitat, providing for conservation easements or parcels of significant size to allow for enhanced management opportunities.

Unit 3B

History-Population Information:

According to the population model, the total population in 2006 prior to the hunt was 401 animals. The population is divided into a north and south herd by US Highway 60 which has a fenced right-of-way, experiences a lot of commuter traffic, and is probably a significant barrier to interchange between these two populations. South of US Highway 60, the population is at minimal numbers and probably declining due to loss of habitat from development and

encroachment on grassland habitat by pinyon-juniper woodlands. North of US Highway 60, this population is declining for the same reasons, but on a much larger scale due to human-related development. Results from surveys show fawn:doe ratios have been below guidelines since 2000 and the total number of animals surveyed has declined since a peak at 350 animals in 1995.

Specific Concerns:

Habitat loss and fragmentation from private land development is a primary concern in northern Unit 3B. This part of the unit has been inundated with residential developments and ranchettes. Development in this area has occurred without provisions for easements and travel corridors for pronghorn.

Another concern is loss of pronghorn habitat to juniper encroachment. Most historical meadows are filling in with young juniper trees. There is little that can be done to slow the developmental encroachment, but the juniper recruitment is being addressed through a variety of funding sources and projects. In addition to the Woolhouse projects, several other projects are in the infant stages in 3B-North that will address maintenance of previous pushes from the 1960's. Large-scale, landscape type improvements have been proposed to link corridors for less restrictive movement of the herds throughout the northern half of the unit. Improvement of the habitat on the Forest Service land in 3B will become increasingly important as 3B-North is subdivided and developed.

The hunt structure for deer addresses human encroachment problems by restricting the firearm type to muzzleloader. It was recommended that this approach be considered for the pronghorn hunt beginning in fall 2008.

Numerous fences occur throughout the pronghorn range in Unit 3B. Some of these fences need to be modified to be pronghorn passable. This needs attention on a case-by-case basis.

Pinyon-juniper encroachment is an issue on the southern parts of the pronghorn habitat. This mainly occurs on Forest Service Land. Grassland maintenance and expansion needs have been addressed during Forest Service Management Planning process. This will help maintain or even expand pronghorn habitat

Predation primarily by coyotes and harassment and/or predation by feral dogs is a concern.

Management Objectives:

- Maintain and enhance current pronghorn population and distribution in suitable habitat in Unit 3B.
- Continue coordination with the US Forest Service Lakeside Ranger District and private landowners to implement treatment of live pinyon-juniper trees and remnant carcasses (including mechanical thinning, fuel wood treatments, and prescribed burning) in order to maintain and expand existing pronghorn habitat. Tree removal should also be conducted in an effort to maintain existing pronghorn travel corridors and to create new corridors to improve connectivity of the isolated blocks of pronghorn habitat located throughout the unit.

- Promote fence modifications with agency and private individuals who own land within pronghorn range in Unit 3B to reduce barriers to pronghorn movement. Ensure that any new fences being built or old fences being replaced are being built to wildlife passable specifications.
- Continue to address pronghorn concerns when evaluating Allotment Management Plan revisions.

Unit 3C

History:

Pronghorn in Unit 3C occupy Great Basin grasslands and open areas (both natural and man-made) within Great Basin Conifer Woodlands. There may be some seasonal migration of animals from Great Basin Conifer woodlands north to the grasslands resulting from snow in the winter months, but most pronghorn movement is to take advantage of higher quality forage that results from variable or “spotty” rainfall patterns. Pronghorn habitat and distribution is almost exclusively restricted to that portion of Unit 3C that lies north of State Route 260. However, since the Rodeo-Chediski fire in 2002, a few pronghorn have been observed south of the highway in open areas created by the fire. North of the Highway, pronghorn are found from State Route 77 west to Phoenix Park Wash.

The majority of the pronghorn habitat in Unit 3C is comprised of Forest Service lands. In the north part of the unit, where the best pronghorn habitat lies, there are 22-23 sections of private land and about 9 sections of State Trust Land. The 1996 Research Branch report on Pronghorn Habitat ratings classified 40 mi² as low, 34 mi² as moderate and 5 mi² as high habitat quality. About 80% of Unit 3C was ranked as unsuitable or poor. As additional areas within the Rodeo-Chediski Burn become more open, thru removal of fire-killed trees and natural processes, we may begin to see an increase in suitable pronghorn habitat within the unit.

Population Information:

Prior to 1991, Unit 3C was managed in conjunction with Unit 3B. From 1992 to 1996, the unit’s pronghorn population went through a period of decline. Since then, the population has rebounded and past survey data indicates a relatively stable population. The 2007 population estimate is 144 pronghorn.

Unit 3C consistently yields a higher fawn recruitment rate, when compared to adjacent units. Five-year average fawn:doe ratios for the unit are often above 30 fawns:100 does. However, lack of suitable habitat, as indicated by the 1996 Research Branch report, is most likely the primary limiting factor preventing this population from increasing. Due to the small size of the pronghorn herd in Unit 3C, environmental influences can have magnified effects on the pronghorn population. As a result, permit numbers have been kept at a level that maintains a conservative harvest while providing a diverse hunting opportunity.

Specific Concerns:

Loss of habitat to rural development is not a significant limiting factor to the pronghorn population in Unit 3C, as is with herds in Unit 3A, since the majority of pronghorn habitat in the unit is comprised of Forest Service lands. However, juniper encroachment continues to be a

leading cause of habitat loss in the unit. The increased tree density in grasslands can decrease forage production and deter pronghorn from using areas as a result of increased visual obstructions created by the trees. The Forest Service is very aware of the tree encroachment issue and supports removal of some stands to retain and enhance the grassland communities.

Numerous fences occur throughout the pronghorn range in Unit 3C. Most of these fences were not built to wildlife standards. Fences along State Routes 277 and 77 restrict movement of pronghorn to and from Units 3A, 3B, and 4B.

Disturbance from human activity may also be a limiting factor in some portions of pronghorn habitat in Unit 3C, however it is not considered to be a widespread problem. As expected, the areas surrounding the urban areas receive more human activity. In addition, the portion of the unit from Clay Springs to Aripine has increased in popularity for OHV recreation and can receive substantial use on busy weekends.

Management Objectives:

- Continue coordination with the Forest Service Lakeside and Black Mesa Ranger Districts and private landowners to implement treatment of live pinyon-juniper trees and remnant carcasses (including mechanical thinning, fuel wood treatments, and prescribed burning) in order to maintain and expand existing pronghorn habitat. Tree removal should also be conducted in an effort to maintain existing pronghorn travel corridors and to create new corridors to improve connectivity of the isolated blocks of pronghorn habitat located throughout the Unit.
- Explore opportunities to plant-seed browse and forbs in conjunction with future juniper treatments.
- Promote fence modifications with agency and private individuals who own land within pronghorn range in Unit 3C to reduce barriers to pronghorn movement. Ensure that any new fences being built or old fences being replaced are being built to wildlife passable specifications.
- Continue to address pronghorn concerns when evaluating Allotment Management Plan revisions.
- Establish dialogue with the Forest Service and within the Department to begin to address off highway vehicle recreation in and near pronghorn habitat. Potential actions may be a project to gauge volume and effects of such use, seasonal closures and/or outreach program in key areas.

Unit 4A

History:

Pronghorn from Wyoming were transplanted into Unit 4A during the 1980's. Pronghorn distribution and population densities in Unit 4A remain constant throughout the year. The primary use area includes everything north of the forest boundary. On Forest Service land, pronghorn distribution remains adjacent to the forest boundary from Chevelon Canyon to East Clear Creek. Pronghorn generally range about 2 to 4 miles south of the forest boundary in the less dense ponderosa pine habitat.

The majority of the pronghorn habitat in Unit 4A is comprised of private and leased State Trust lands. The private land habitat is comprised of three major landowners. They include the Hopi Indian Tribe, the Ohaco Family, and Molly McCauley. Within the McCauley Ranch, there are several small parcels of land that are developed. Unit 4A pronghorn habitat is comprised of roughly 263 sections of land. Livestock management on these sections is managed by (State Land sections figure into the lessees percentage): Hopi Indian Tribe - 63%, Ohaco - 27%, McCauley - 7%, and Forest Service - 3%.

Population Information:

The Unit 4A pronghorn population has remained relatively stable over the last five years around 400 animals. Double-count survey estimates are consistent with the long-term population trend from computer modeling. Pronghorn densities were estimated at 1.65 pronghorn/mi² in 2007.

Specific Concerns:

Numerous fences occur throughout the pronghorn range in Unit 4A. Some fences need to be modified to be pronghorn passable. This needs attention on a case-by-case basis.

Water distribution in Unit 4A is highly variable throughout the year. The three main ranches in Unit 4A use wells and dirt tanks to provide water for their livestock. These same waters make up all the available wildlife waters. There are a couple of exclusive wildlife waters on Forest Service Land, which are used by pronghorn.

Pinyon-juniper encroachment is an issue in the southern parts of the pronghorn habitat. This mainly occurs on Forest Service Land. Grassland maintenance and expansion needs have been addressed during Forest Service Management Planning process. This will help maintain or even expand pronghorn habitat

Forage conditions and plant diversity is a year-to-year issue. With the majority of pronghorn habitat on checker boarded private and state land, overgrazing can be an issue. Overgrazing becomes an issue during the last trimester of the doe's pregnancy and the fawning period. Pronghorn does rely on spring forbs to maintain a high quality body condition through their last trimester. Fawns rely on the residual summer grasses for hiding cover from predators (mainly coyotes). When winter and spring precipitation reaches normal levels, forb production is good. However, to maintain adequate ground cover, it is important to have widespread summer rains. When Unit 4A experiences this type of rainfall, the ranching operations can use some pastures during the winter while leaving other pastures ungrazed. These ungrazed pastures become very important for fawns in the spring. If summer rains are scattered, there is not always enough feed to leave any ungrazed pastures by fawning season. Without this ground cover, fawn predation can be a limiting factor.

Predation primarily by coyotes is a concern. Control efforts have been conducted in this unit on several occasions, with some marked improvements in fawn recruitment.

The Department coordinates pronghorn management activities with Forest Service personnel, owners of the Ohaco Ranch, and the Hopi ranch manager. Most pronghorn management on the Forest centers on clearing of encroaching pinyon and juniper woodlands and wildlife water

distribution. In the mid-1990's, the Department worked collaboratively with the Forest Service and the Ohaco Ranch owners to install a major water delivery system across the southwest portion of the pronghorn habitat. Pronghorn surveys have been flown with Department and Hopi representatives as observers since 1998.

The Hopi Nation is in the process of purchasing the State Lands associated with the Hopi ranch. They have announced their intentions to convert this ranch into Reservation Status, and the Department will no longer have management responsibility of these pronghorn. The Department is coordinating with members of the Hopi Nation, and has offered to assist in wildlife management issues. However, what future role the Department will play is unknown.

One major concern is the future of the Ohaco Ranch. This ranch lies between the Hopi Ranch and the Forest Service Lands. This ranch provides both suitable habitat for pronghorn along with offering an unrestricted travel corridor between Forest Service lands and the Hopi Ranch. Any future development (sub-divisions) could drastically affect this herd. The Department should take measures from allowing this Ranch to ever be sold to developers

Management Objectives:

- Maintain and enhance current pronghorn population and distribution in suitable habitat in Unit 4A. Become an active partner in the management of the wildlife on the Hopi Ranch.
- Maintain and enhance large contiguous blocks of pronghorn habitat.
- Increase water dependability and distribution.
- Encourage predator management by private landowners and sportsmen.

Unit 4B

History:

This population is bisected by Interstate I-40 in the northern portion of the unit. Most pronghorn in this population reside south of the interstate and north of the Sitgreaves National Forest boundary. A few animals use habitat within the forest boundary and north of I-40. Starting in 1977 survey efforts observed 164 pronghorn in 4B. In 2007, 146 pronghorn were observed. Pronghorn survey observations have ranged as high as 335 in 1999 and as low as 81 in 1991. No reintroductions or population augmentations have been implemented in 4B to date.

Population Information:

The largest contiguous area of suitable pronghorn habitat in Unit 4B is located between Dry Lake and Chevelon Canyon to the west, north to the Little Colorado River. Unit 4B pronghorn population estimates show a slightly declining population over the last 10 years. In 2005, 4B fawn recruitment was the highest it had been in 10 years. In 2006, fawn recruitment leveled off at 23:100 equaling the 5-year average. In 2007, fawn recruitment was again above the 5-year average at 28:100. Consecutive years of increased recruitment could result in a stable or increasing population in 4B. Continued monitoring and improvement of range conditions throughout the unit will help this population to continue to grow.

Specific Concerns:

According to the Statewide Pronghorn Habitat Evaluation, modifications to livestock and wildlife grazing may be necessary to increase plant species richness. Low annual rainfall in the northern portions of the unit hinders recovery of this richness. One factor that can be controlled is the grazing regimes (numbers, species, duration, and rotation) currently employed in 4B. Prescribed burns could also be used to increase diversity, but coordination with permittees and land managers is necessary to develop a plan under current land ownership.

Juniper densities are increasing along the transition zone between woodland and shrub-grassland types found in the unit. The size and connectivity of open areas throughout the unit should be enlarged and connected to other treated or existing grassland areas. Identifying movement corridors and high use areas is important and can be done using aerial survey information. The information collected can then be incorporated into a strategic plan for tree removal. Maintaining current juniper pushes and connectivity to open grasslands is also needed.

Water availability throughout the unit is questionable, with low average rainfall and high evaporation potential. Livestock waters are numerous but do not appear to be reliable year-round sources for pronghorn. During drought conditions, these did not appear to be capable of holding water year-round. This was especially noticeable north of I-40. Higher elevation waters, that are more reliable, are not found in preferred pronghorn habitat and so do little to provide year-round support for pronghorn.

Fences in and around Unit 4B inhibit movement of Pronghorn within the unit as well as in and out of the unit. I-40 to the north prevents the movements of pronghorn herds into and out of the northern portion of the unit. State Routes 377, 77, and 277, which make up the eastern boundary, carry less traffic than I-40 and so fence modifications and/or removal in some areas would help mitigate their fragmentation effect. Other modifications could include moving fences further away from roadways and replacing lower strands of barbed wire with smooth strands at least 41-46 cm above the ground. Coordination with permittees, transportation agencies, and landowners can determine which fences could be modified to facilitate movement of pronghorn. Livestock fences within Unit 4B are numerous. Most of the common barbed wire fences could easily be modified to improve movement of pronghorn by replacing lower strands of barbed wire with smooth wire at least 41-46 cm above the ground. North of I-40, fence modification should occur before reintroduction efforts occur. Other livestock fences within the unit may no longer be necessary for sound livestock management and should be removed. Coordination with allotment permittees, landowners, and land managers could identify which fences are still necessary, need modification, or can be removed.

Recreation throughout most of the pronghorn habitat is probably minimal most of the year. Higher levels of disturbance caused by recreation activities are typically around the developing areas of Chevelon Retreat, Chevelon Ranch, and at higher elevations not typically used by pronghorn.

Development within Unit 4B has typically been located along the boundaries and consists of Winslow, Holbrook, Joseph City, Heber-Overgaard, and Forest Lakes. These areas have not yet substantially expanded into pronghorn habitat and pose minimal impact on pronghorn. Within

4B, the areas of Chevelon Retreat and Chevelon Ranch continue to be developed into ranchette type developments. The associated roads, fences, and increased disturbance will affect pronghorn movement and available habitat. Continued coordination with developers, and county and city municipalities will be needed to minimize negative impacts on pronghorn within the unit.

Management Objectives:

- Maintain pronghorn habitat and travel corridors through cooperation with land management agencies and private or other landowners.
- Evaluate and modify livestock fences to pronghorn specifications.
- Greater use of controlled burning to restore grassland habitat and increase plant species diversity.
- Continued and increased removal of encroaching juniper or pinyon-juniper woodland types through chaining, fuel wood cuts and prescribed burning.
- Encourage predator management by private landowners and sportsmen.
- Encourage non-governmental organizations, such as The Arizona Antelope Foundation and The Nature Conservancy, to participate in grassland conservation and management.
- Avoid any additional fence construction, but if necessary, it should meet Department criteria to allow for pronghorn movement (wildlife specification fencing).
- All public and state lease lands must maintain water sources year round. During drought conditions, water must be left in earthen tanks for wildlife.
- Repair and/or improvement of earthen tanks to maintain water holding ability and capacity.
- If existing waters are lost to development, new waters should be created for use by pronghorn.
- Any changes in public land grazing plans shall incorporate the annual and seasonal habitat requirements of pronghorn.
- Continued involvement in regional planning efforts, including county and city municipality planning.

Unit 27

History:

Pronghorn in Unit 27 are located primarily within the Upper Eagle Creek watershed. The population consists of a small indigenous herd that received a supplemental transplant of 55 pronghorn in 1999. Pronghorn typically range from the Mud Springs area south to Sunflower Mesa, and have been seen no further east than Black Mountain. Many pronghorn travel back and forth onto the San Carlos Indian Reservation.

The majority of the pronghorn habitat in Unit 27 is comprised of Forest Service lands. There are some small private lands along Eagle Creek.

Population Information:

Aerial surveys are conducted annually for pronghorn in Unit 27. Anywhere from 12 to 38 animals are classified. No population estimate is available due to the transient nature of this herd across the San Carlos Apache Reservation boundary. In recent years, pronghorn have been observed in the northern portion of the unit along the Black River in Rocky Prairie. These pronghorn most likely immigrated from Unit 1.

Specific Concerns:

Numerous fences occur throughout the pronghorn range in Unit 27. These fences separate public and private land, allotments, and pastures within those allotments. Fencing that does not meet game standards is common. Efforts are being made on public lands to modify or replace existing fences to make them more suitable to pronghorn movement. Fences on private lands will be dealt with on a case-by-case basis. Any new fences on public land will be built to wildlife passable specifications.

Tree and shrub encroachment is a concern in Unit 27. Pinyon and Juniper continue to invade grassland areas that are critical to pronghorn. With such a small fraction of the unit suitable for pronghorn use, it is important that these areas are maintained.

Forage conditions and plant diversity could affect pronghorn on Forest Service allotments if overuse of these areas occurs. Overuse of the forb component could affect nutrition for pregnant pronghorn, and late season grazing could affect critical hiding cover for fawns.

Human activity may be a limiting factor along Eagle Creek, however it is not considered to be a widespread problem. The area does receive a fair amount of deer hunting pressure, which may influence pronghorn use areas. This hunter impact is of short duration and is not during the critical fawning period.

Predation of fawns is a concern. Since this is such a small population, it is even more important to maintain fawn survival at or above maintenance levels. Given the close proximity to steep terrain and dense cover, this herd is susceptible to predation from many predator species. They include mountain lions, bobcats, Mexican wolves, coyotes, and golden eagles.

Most pronghorn habitat in Unit 27 is managed by the Forest Service. The Clifton Ranger District supports continued efforts to increase the pronghorn population. Pronghorn needs are considered when evaluating livestock grazing management.

Management Objectives:

- Maintain and enhance current pronghorn population and distribution in Eagle Creek portion of Unit 27.
- Maintain and enhance large blocks of pronghorn habitat.
- Modify livestock fences to wildlife standards.
- Consider Unit 27 for future pronghorn transplants.

REGION II

Units 5A and 5B – Anderson Mesa Herd

Origin of Plan:

The Department developed plan specifically for the Anderson Mesa pronghorn herd as part of a process involving the Department, the Coconino National Forest, the Arizona State Land Department, the Hopi Tribe, The Diablo Trust, ranchers from the Flying M and Bar T Bar, the Arizona Antelope Foundation, the Arizona Wildlife Federation, and the National Wildlife Federation. Greater detail may be found in that plan, along with an implementation matrix with tasks and timelines.

History and Background:

Units 5A and 5B contain the Anderson Mesa pronghorn herd. The boundaries of the herd area are Interstate 40, Leonard Canyon, the Mogollon Rim, State Route 87, Forest Highway 3, and Walnut Canyon. The herd area includes all of Units 5A and 5B. Pronghorn north of Interstate 40 are functionally connected to pronghorn herds in Units 4A and 7.

The pronghorn habitat in the Anderson Mesa Herd Area varies from ponderosa pine to great basin grasslands. This herd has historically been larger than it is currently, and has fluctuated a great deal. The herd has suffered die offs and had large increases since 1900.

Survey and Harvest Trends:

The pronghorn in these units are functionally split in two herds. One group of pronghorn spends the winter at lower elevation lands and spends the rest of the year on Anderson Mesa. The second group lives year-round in the lower elevation habitat. These herds are functionally separate because they breed and give birth while in separate areas. They all winter in the same grasslands and shrub lands, primarily on State and private lands. We know very little about interchange of pronghorn between these herds.

Specific Concerns:

The primary management issue for the Anderson Mesa Pronghorn Herd is low fawn recruitment. Pronghorn literature suggests that most does conceive and carry twin fawns to parturition, although low fawn recruitment has several potential causes including predation, competition, disease, nutrition, and disturbance. From 1991 to 2000, surveyed fawn per 100 does varied from between 1 and 21. The point where recruitment exceeds mortality is most likely to be in the range of 20 to 35 fawns per 100 does. A long period of low recruitment occurred in the 1990s, possibly in response to increasing average age of does.

Increasing hiding cover for fawns also could improve fawn survival. Leaving grass cover standing in the fall in selected pastures can provide fawn hiding cover the next spring under some conditions. After wet winters the residual pronghorn fawn cover may not be as useful if the grass cover is packed down by snow and ice. The other source of fawn hiding cover is new growth from the current spring. The amount of growth before fawns are born appears to vary

with weather.

Three methods have been proposed for improving nutrition: 1) burning, 2) cutting pinyon, juniper, and pine where trees have invaded grasslands or have become denser on savannas, and 3) altering grazing practices.

Predation on pronghorn fawns has been shown to be a serious problem on Anderson Mesa. The only remedy that has a known effect is to remove coyotes. Coyote control should be proposed as part of a larger integrated management package, and may be necessary until habitat improvement demonstrate an effect.

Water is available on Forest Service lands and is fairly dependable. On the State and private lands there is less information. The largest question is not so much whether a stock tank is present but whether the tank is likely to hold water in normal or drought conditions during the fawning season.

Management Objectives:

Maintain a herd in the historical (1900 to 1967) range of pronghorn numbers for Anderson Mesa, both the migratory herd, which summers on Forest Service Lands, and the nonmigratory herd which lives on State and private lands yearlong. Despite limitations in using surveys numbers as a herd estimator, use total pronghorn observed on surveys to monitor this goal as the best available information. Focus on increasing fawn recruitment into the herd through habitat project funding and cooperation between the Department, the Forest Service, State Land Department, Hopi Tribe, ranchers, and other stakeholders.

Use the following triggers for increasing management action to benefit these pronghorn. If surveys decline to 200 or fewer does observed 3 years out of 5, or if surveys show fewer than 25 fawns per 100 does more than twice in 5 years, take additional action to increase the herd.

- Improve forage diversity and health, and fawn hiding cover in pronghorn habitat
 - Continue to remove juniper, pinyon and ponderosa pine trees from invaded grasslands and savannas.
 - Evaluate grassland burning on a variety of soils and grassland vegetation types on Anderson Mesa by burning 1,000 acres.
 - Target 60,000 acres of pronghorn habitat treatment (including both woody vegetation removal and burning of woodland, slash, and grasslands, within 10 years on Forest Service lands.
 - Encourage and assist the Forest Service, State Land Department and Diablo Trust in developing and implementing fire plans for areas of pronghorn habitat.
 - Target 20,000 acres of treatment (including both woody vegetation removal and burning) on State Land Department, Hopi, and private lands within 10 years.
 - 876 acres slated for treatment through 2009 on the Clear Creek Ranch, which will border 4,000 acres treated on the Bar T Bar Allotment.
 - Target 2000 acres of treatment (including both woody vegetation removal and burning) within 5 years on Raymond Wildlife Area.

- Manage elk herds with the intent of avoiding substantial negative impacts on pronghorn forage or fawning cover.
 - Manage elk at a level where elk impacts on pronghorn forage or fawning cover are not significant through the fawning period.
 - Continue to reduce elk numbers that use winter range during the summer. Summer elk surveys indicate the Limited Opportunity hunts on State and private lands to address residential elk on winter range have been successful.
- Improve forage availability for pronghorn on Anderson Mesa ephemeral wetlands.
 - Modify fences as needed to permit passage by pronghorn and to improve durability.
 - Record use of ephemeral wetlands by pronghorn when incidentally observed to provide information about the timing of use.
- Improve distribution of pronghorn, access migration routes and access to forage by improving fences.
 - Complete inventory of fences on Forest Service and private (with permission) lands on Anderson Mesa.
 - Meet or exceed 18 inch bottom wire standard on all fences on Raymond Wildlife Area.
 - With permission and cooperation, inventory fences on State Land Department, Hopi Tribe and private lands for compatibility with pronghorn needs.
 - Investigate the potential for removing or modifying fences (such as with let-down panels) in movement corridors, such as from Anderson Mesa to winter range.
- In conjunction with other objectives, use predator management when appropriate to reduce predation with emphasis on predation on pronghorn fawns.
- Improve water availability
 - Continue to update the Department Regional drought plan in response to pronghorn concerns as information becomes available. Include consideration of emergency water distribution system for Pine Hill, which may minimize water-hauling effort.
 - Improve access to waters by modifying water lot fences in pronghorn habitat in cooperation with ranchers.
- Supplement population
 - If does on surveys drop below 200 animals for 2 years and fawn doe ratio is below 25 for the same 2 years, or if habitat conditions are adequate to support the pronghorn, evaluate supplementing the population with pronghorn from other areas. The Department transplanted 66 pronghorn from Prescott Valley to Meteor Crater in Unit 5A in February 2007.

Unit 6A

History and Background:

Pronghorn were abundant and well distributed throughout Unit 6A in the 1950s but since 1962, the numbers have dwindled and some herds have disappeared. Historically, pronghorn were abundant on Mud Tank Mesa, Cedar Flats, White Mesa, Apache Maid area, and in the open parks throughout the ponderosa pine habitat from Upper Lake Mary to Mahan Park.

With the development of Interstate 17 and the paving of State Route 260 in the late 1960s and early 1970s, much of the interchange between summer and winter habitat for pronghorn was fragmented. Pronghorn could no longer use much of the Verde Valley as winter range; areas like Jacks Point were isolated, and herds began to decline. As the human development in the Verde Valley increased, more habitat was fragmented and lost. Human development and increased livestock fencing in the pine type reduced pronghorn use of that habitat.

Habitat Description:

Unit 6A covers about 1,172 mi² but only 23 mi² are considered high or moderate quality pronghorn habitat. The unit lies in the area south of Flagstaff and north of Camp Verde. The majority of the pronghorn habitat in Unit 6A is within the Coconino National Forest (USDA). A small percentage of the available habitat is privately owned.

Vegetation within the unit comprises mixed conifer woodlands, pine-oak woodlands, pinyon-juniper woodlands, and grassland-desert-scrub communities. Elevations range from less than 4,000 feet in the southern portions of the unit to over 8,000 feet in the higher areas. The unit contains some very large canyons (Beaver Creek, West Fork of Clear Creek) that likely pose tremendous barriers to pronghorn movement. Water is well distributed throughout the unit in the form of lakes, creeks, and earthen stock tanks designed to support livestock grazing operations.

Above about 6,800 feet elevation, the unit is dominated by ponderosa pine forests with natural meadows scattered throughout. Between 4,500-6,800 feet elevation, the vegetation is dominated by pinyon-juniper woodlands. Historically, many areas were chained or pushed to create new grasslands or enhance natural grasslands to benefit livestock grazing. Below 4,500 feet elevation, the pinyon-juniper transitions into a mesquite-grassland community.

Specific Concerns:

Although pronghorn evolved with a number of major predators, habitat degradation and fragmentation have created an imbalance in the predator-prey relationship that does not favor pronghorn. Coyotes, mountain lions, bobcats, and golden eagles likely are likely more effectively at killing pronghorn (adults and fawns) in a negatively altered habitat.

The pronghorn in Unit 6A occupy grassland-desertscrub habitats, pinyon-juniper woodland-grassland habitats and less traditional pine-oak woodland habitats. Much of the available pronghorn habitat in Unit 6A is being invaded by pinyon-juniper and pine causing the degradation of habitat by a decreased plant diversity and forage value. Invading species also increase vertical structure making pronghorn more vulnerable to predation.

Land management practices including fire control and grazing have enhanced the growth of less desirable native and exotic plant species. Less desirable species have thrived while many desirable species have decreased in abundance. As woody species encroachment occurs, the herbaceous understory has suffered from increased canopy cover and direct competition for water and nutrients.

Habitat fragmentation is a key issue in Unit 6A as in other areas of the state. The barriers provided by right-of-way fences and highways such as Interstate 17, Forest Highway 3 and State Route 260 have greatly reduced the ability of Unit 6A pronghorn to use the available habitat. The barriers provided by roads and fences likely prevent any opportunity for ingress from adjacent pronghorn populations. Geographic barriers such as steep canyons also tend to fragment the available habitat as does the increasing tree density due to woody plant invasion.

Livestock grazing has necessitated the construction of allotment and pasture fences. These fences have provided additional barriers to pronghorn movement.

Past heavy grazing by livestock and wildlife has tended to reduce available forage, reduce plant species diversity, and limit fawning cover.

Water is generally well distributed in Unit 6A with earthen tanks being well distributed throughout the unit. Additionally, Upper and Lower Lake Mary and Mormon Lake provide water in the eastern portion of the unit. However, sustained drought greatly decreases the amount of available water as stock tanks and even lakes dry up for extended periods. Livestock further deplete the available water during drought.

Although only a fraction of the pronghorn habitat in Unit 6A is privately owned, many parks in the pine-oak woodland habitat types have been developed and the remaining private holdings are in jeopardy.

Management Objectives:

Human development has caused permanent loss of pronghorn habitat, mostly in the Verde Valley. Major highways have further fragmented habitat causing additional losses. Options to recover this pronghorn population need to focus on reducing competition with other grazers, reducing shrub encroachment, improving forage quality and plant diversity, removing fences, and possibly managing predation. All of these options are within the control of the Forest Service or Department and, therefore, can be addressed if those two agencies make a commitment to recovering this pronghorn herd. Currently, no commitment has been made nor any project priorities established.

Units 6B and 8 Herd

Management Objectives:

The pronghorn herds in Units 6B and 8 function as metapopulations centering on warm-season habitat at Garland Prairie and winter-yearlong habitat east of US Highway 89. US Highway 89 (Sullivan Lake to Ash Fork, west boundary of Unit 8) and Interstate 40 (north boundary of Units 6B and 8) isolate the herd from pronghorn in adjacent Units 7, 10, and 19B. Physical obstacles,

such as the Mogollon Rim and Woody Ridge, block pronghorn interchange to the east and south in Unit 6B. Documented interchange across the Verde River Canyon west of Perkinsville allows genetic diversity to flow through this population-permeable barrier between Units 8 and 19A. Managing obstacles to ease pronghorn movement will aid gene flow and ensure seasonal migration capability. Both units face three critical management objectives:

- Maintain and restore grassland-savanna habitats.
- Consolidate habitat and maintain travel corridors linking grasslands-savannas.
- Reduce barriers to movement.

The western extension of the Mogollon Rim divides Unit 6B into a northern upland plateau and a southern valley grassland savanna. The northern half supports summer seasonal habitat of about 150 square miles occupied by a pronghorn herd with linkage to Garland Prairie in Unit 8. The southern half is consistent with the general Verde Valley pronghorn habitat and covers about 100 square miles.

The northern upland of Unit 6B is a plateau with some rolling hills and small, steep volcanic mountains. Elevation generally exceeds 7,000 feet and Woody Mountain and Volunteer Mountain both reach 8,000 feet. Ponderosa pine forest dominates the vegetative communities in the north half of Unit 6B often in association with Gambel oak. Inclusions of mixed conifer occupy north aspects of canyon terrain and the north slope of Volunteer Mountain. A unique mixed conifer savanna occupies limited acreage near Volunteer Canyon at Camp Navajo. Small grasslands up to 2,000 acres interrupt the forest canopy on Camp Navajo, at Rogers Lake, Fry Park, and Mill Park. Other smaller linear meadows add some diversity.

A rating system evaluated pronghorn habitat by sections within the area: 88% as poor quality, 4% as low quality, 8% as medium quality, and none as high quality. The 150 sections of potential pronghorn habitat in the northern half of Unit 6B center on moderate quality habitat around Rogers Lake, Mill Park, and Fry Park. A total of 160 sections of habitat were rated by Ockenfels as potentially suitable pronghorn habitat, including 9 sections in Unit 11M that were part of Unit 6B in 1996.

The Unit 6B pronghorn population tends to use the three core areas of medium quality habitat. Additionally, they frequently use the grasslands and savannas found at Camp Navajo. During drought periods, the spike-rush-wet meadow plant community at Rogers Lake attracts high use. Ponds constructed to support grazing of livestock adequately supplement natural water sources.

The Windmill Ranch occupies the central core of the pronghorn range in the north half of the unit. The ranch has been supportive of pronghorn management activities, participating in the Wheatfield juniper control project in the south half of Unit 6B. The Windmill Ranch has recently been offered in the real estate market. The range is grazed during the warm season (June-October), and range condition plots indicate a static trend in ground cover and species diversity. The Manterola Sheep Ranch leases summer range flanking the Windmill Ranch on the east and west edges of Unit 6B. Allotment boundary fences of net wire persist as an obstacle to pronghorn movement. Camp Navajo was leased for warm-season cattle grazing through 2002, but grazing has since been terminated.

Unit 6B

A pronghorn telemetry project initiated in 1999 tracked members of the Garland Prairie herd in Units 6B and 8. A migration corridor linking Garland Prairie to Wagon Tire Flat skirts south and west of Bill Williams Mountain to access lowland (about 4,000 feet elevation) winter habitat along the west boundary of Unit 8. Telemetry data from a Unit 6B pronghorn indicate that the north-Unit 6B herd follows this migration route, often staging at Garland Prairie and/or Hat Ranch during the migration seasons.

The north herd in Unit 6B contains about 40 pronghorn, primarily using Rogers Lake, Mill Park-Yellow Flat, Fry Park, and Camp Navajo. Ongoing (2007) Wildland Urban Interface fuel treatments on the Northern Arizona University Centennial Forest and Coconino National Forest Woody Ridge have reduced ponderosa pine stand basal area to increase pronghorn use of the boundary area of Units 6B and 11M (Flagstaff Well Field, Fisher Tank- Budweiser, Rogers Lake adjacent). The Woody Ridge project will continue southward to Fry Park, creating more linkage between the meadow cores.

From 1997 to 2006, Unit 6B featured an archery hunt with 30 tags. In 2008, 25 tags will be recommended. Harvest has averaged 3 bucks annually.

Specific Concerns:

- Juniper encroachment into grassland habitat in the Putney Flat and Perkinsville area has impacted habitat quality.
 - The Prescott and Kaibab National Forests have begun an effective juniper management strategy prioritizing treatment of travelways to aid habitat connections.
- Threats to movement corridors.
 - Identify and enhance potential pronghorn movement corridors by removing juniper and ponderosa pine and modifying fences.
- Poor habitat-range conditions.
 - Work with the Forest Service and livestock operators to develop livestock rotation plans which leave vegetative cover in key pastures during the critical pronghorn fawning season.
 - Work with the Forest Service and State Land Department to prioritize pronghorn habitat in their prescribed burn program.
- Isolated populations may become non-viable due to reduced size, lack of genetic variability, and lack of emigration-immigration.
 - Determine potential pronghorn corridors between sub-populations and enhance them to encourage pronghorn movement.
 - Use transplanted pronghorn to bring genetic variability into isolated populations.

Unit 8

Specific Concerns:

- Continue pronghorn movement research (Units 6B, 8, and 19A) to identify herd movement corridors
- Reduce use of electric fences if they are a mortality factor
- Modify fences along roads to facilitate pronghorn movement (i.e. wildlife specification fencing, goat bars, staging areas) and resist fencing along roads on migration corridors (Perkinsville Road)
- Modify fences along railroads to facilitate pronghorn movement
- Remove juniper from Rabbit Bill to Putney Flat and in the Perkinsville area
- Encourage wider utility corridors through juniper woodlands in pronghorn habitat
- Encourage predator control when appropriate

Units 7 and 9 Herd

History and Background:

Land status includes private land (including local municipalities), State Trust Land, and federal land managed by the Coconino and Kaibab National Forests. The BLM manages only about 3 sections in Units 7 and 9. Management of federal and private-state checkerboard lands under the management of Babbitt Ranches and McNelly Ranches offer special opportunities as these private entities are cooperative in efforts to enhance conditions for pronghorn.

The units contain about 3,239 mi² of occupied pronghorn habitat, consisting of about 11 mi² of high quality habitat, 548 mi² of moderate quality habitat, 670 mi² of low quality habitat, and 1913 mi² of poor quality or unsuitable habitat. The evaluation found that the grasslands had some understory diversity, but areas of short shrub (sage brush and rabbitbrush) invasion should be kept in check. Additionally, tall shrub and tree (pinyon-juniper) encroachment poses a threat to the continued integrity of the grassland. Finally, the evaluation found that habitat quality posed the single greatest concern for pronghorn in the area, while wire fences and lack of water during drought are also very serious.

Unit 7 encompasses about 1,576 mi². About 5.5 mi² of the unit are classified as high quality pronghorn habitat and 380 mi² are considered to be of moderate quality habitat. Most favorable habitats for pronghorn are located in the upper elevation grasslands-parks interspersed in the ponderosa pine type and at lower elevations north in moderately grazed Great Plains grasslands.

Unit 9

History and Background:

The 1,645 mi² in Unit 9 include only 5 mi² of high quality pronghorn habitat and 164 mi² of moderate quality habitat. Most of the suitable habitat is situated along the western boundary.

The majority of the pronghorn in Unit 9 east of State Rout 64 occur on state and private checkerboard land north of US Highway 180 and the Coconino National Forest, south of the northern block of the South Kaibab National Forest and to the west of that portion of the Navajo

Indian Reservation extending to the south from the forest. Still east of State Route 64, another concentration of pronghorn resides in the area of Camp 36. The pronghorn on the east side of State Route 64 migrate in a generally north to south pattern ranging from as far north as Camp 36 in Unit 9, to as far south as the Parks area in Unit 7.

The majority of the pronghorn on the west side of Unit 9 generally stay year around on the state and private checkerboard land along Cataract Canyon. The pronghorn will occasionally cross back and forth through the shallow portions of Cataract Canyon to Unit 10.

Livestock fencing is present in most of the sections through out the unit. The western portion of Unit 9 has a greater occurrence of woven wire fence, especially in the area of Little Harpo Canyon. Several of the earthen tanks that have seven-wire, ten-wire, and woven-wire fences surrounding them.

Several projects have been done to help improve pronghorn habitat and populations in the unit including fence, agra axe, and water projects. The Department plans to continue to propose projects using brush hogs, agra axes, native reseeding projects, removing unnecessary woven wire fences and seven and ten wire fences around waters, and increasing the availability of year around water sources especially in established fawning grounds.

Management Concerns:

Some of the areas primary threats to the pronghorn population are drought (poor quality habitat conditions), range management (competition with livestock), predation, loss of habitat by development, and the resulting fragmentation and isolation. Habitat protection and improvement is the number one priority. Habitat improvements will not allow a drastic increase of the pronghorn population, though they will help ensure a stronger and healthier population. Making greater efforts to capitalize on the mitigation and research opportunities that present themselves will allow the Department to make advancements in producing quality habitat.

At that time, other specific management actions may include short-term changes to hunt structures from firearms to muzzleloader or archery, allowing the opportunity for population increases.

Management Objectives:

- Woody species invasion.
 - Map soil types and lands that formally supported grasslands and savanna habitat types.
 - Work with wildlife organizations, land managers, and other publics to develop land management plans to restore grasslands for grassland species.
 - Work through the HPCs and other private organizations and land managers to fund pinyon-juniper and ponderosa removal from invaded grasslands and savannas at all elevations. Target most productive sites initially.
 - Aggressively support and encourage prescribed burning of grasslands by land managers (e.g., burning of Government Prairie by the Kaibab Forest).
 - Develop plans for maintaining a mosaic of connected openings in areas burned by wild fires in the ponderosa pine belt. In these designated areas, pile and burn down and standing timber and periodically burn to retain open condition.

- Forage needs.
 - Initiate "water harvesting" on the private lands of cooperating ranchers. "Water harvesting" is a technique that creates numerous shallow depressions in the ground to disturb soil and capture water run-off. The depressions are of varying sizes, one to three feet deep and are one-tenth to one-half acre in size. "Water harvesting" would break dominance by blue grama in treated areas and would allow a better mix of vegetation needed by pronghorn and other grassland species.
 - Disc grassland flats dominated by blue grama on private lands to increase plant diversity. Seeding of disturbed sites with cool season grasses and desirable browse like saltbush and winter fat could benefit the range. Monitor disturbed sites for the presence of undesirable species. Again, ground disturbance on public lands is difficult to achieve.
- Forage overuse.
 - On winter range, remove competing pinyons and junipers from areas supporting desirable browse plants.
 - Control livestock and elk use to protect desirable browse on winter range.
- Predation
 - Lion predation on pronghorn is most often associated with cover in some form. Reduce woody cover in areas managed for pronghorn to limit lion predation effectiveness.
 - Reducing the lion population in areas managed for pronghorn may also benefit pronghorn.
 - Concentrated use of steel trapping on private lands can be effective in reducing the density of coyotes to benefit pronghorn.
 - Free ranging dogs are not uncommon in Unit 7 East and in the Woodland Ranch and Red Butte areas of Unit 9. These dogs harass and likely kill pronghorn and other wildlife.
- Fences.
 - Map fences in pronghorn range that need modification or could be removed.
 - Evaluate new cross-fence construction by land managers. Educate land managers about the problem fences pose for pronghorn.
- Loss of Habitat to Human Development.
 - Document examples of losses and educate the public about the problem.
 - Investigate federal programs and educate Department employees about those programs (e.g., conservation easements) so they can explain them to landowners. Some landowners are vitally interested in maintaining their ranching heritage.
 - Educate people in subdivisions about the needs of wildlife like pronghorn to help people live with wildlife.
 - Actively participate in land-planning efforts (e.g., Coconino County Planning) to provide information and influence on behalf of the needs of pronghorn.

- Fragmentation of Habitat.
 - Map movement-migration corridors used by pronghorn.
 - Work with the Forest service to open up forests and woodlands in movement corridors used by pronghorn.
 - Work with landowners and land managers to remove unneeded fences and to provide "goat bars" in required fences to lessen the impacts of fences on pronghorn movements, with an emphasis on migration corridors.
- Water Distribution.
 - Map surface waters available for pronghorn and plan construction of new waters where distribution of waters is lacking. Pursue grants (e.g., HPC funding) for new construction.
 - Improve-rebuild-repair key existing water facilities. Pursue grants for funding.
 - Work with land managers and private landowners to provide access to heavily fenced livestock waters. Providing small water sources outside the enclosed livestock water may be required. Such water could be shut off and emptied of water during livestock gathering operations.

Units 12A and 12B

History and Background:

Pronghorn were historically present in the Great Basin grasslands of House Rock Valley in Unit 12A and 12B. This population has been cyclic in a direct relationship with precipitation. Post survey population estimates have varied from 91 pronghorn to 142 over the last 10 years. During periods of drought, poor fawn survival has resulted in low recruitment and, conversely, during normal to above normal precipitation years, fawn survival and recruitment increase.

Habitat Descriptions:

House Rock Valley is primarily public land managed by the Forest Service and BLM. There is a small 12ha ranch managed by the Department in the southern part of House Rock Valley and a few small private land holdings in the northern part of House Rock Valley. There are three working ranches in House Rock Valley with grazing allotments on the public lands. Overall, pronghorn habitat in these units is very small compared with the rest of the state.

- Total area for Unit 12A is 1,664 mi².
- Suitable pronghorn habitat in 12A is 81 mi² with only 46 mi² being moderate and 0 being high quality.
- Total area for Unit 12B is 1,168 mi².
- Suitable pronghorn habitat in 12B is 359 mi² with 146 mi² being moderate and 2 mi² being high quality (roughly 3/4 of this estimate occurs in House Rock Valley).

Pronghorn habitat in House Rock Valley is primarily Great Basin Grassland with areas of sagebrush, shrub and some juniper encroachment. House Rock Valley has been identified as a reduced species richness grassland. Grasses include Indian ricegrass, blue grama, three-awn, and cheatgrass. Big sagebrush is primarily responsible for the invasion of the grassland with large monotypic stands becoming prevalent in the southern portion of House Rock Valley. Other

shrubs found in House Rock Valley include snakeweed, rabbitbrush, saltbush, Mormon tea, and fringed sagebrush. Some of the eastern fingers of the Kaibab Plateau are also used by Pronghorn. These fingers have open stands of grasslands being encroached upon by closed canopy woodlands of junipers and pinyon pine.

Management Concerns:

Typical of small populations, the House Rock Valley herd is very susceptible to limiting factors such as lack of plant diversity and overgrazing. Other limiting factors that have been identified are predation, fragmentation of habitat, fences, lack of fawn hiding cover, and possibly over hunting. Many of these limiting factors are directly and indirectly related to one another. Also, drought has long been identified as having a direct affect on pronghorn populations in Arizona. Primary management issues for the House Rock Valley population in order of having the most impact include:

While there is little encroachment from PJ, there are large monotypic stands of sage encroaching upon the grasslands. This results in loss of habitat, decrease in forage species richness, blocking of travel corridors, and an increase in predation.

Besides the encroachment of shrubs, low plant species diversity was identified as one of the main limiting factors for pronghorn in the moderate to low quality habitat in House Rock Valley. Besides lack of nutrition, low species diversity also relates to lack of fawning cover. Low plant diversity was likely the result of prolonged overgrazing by livestock and fire suppression.

Excessive livestock grazing is detrimental to pronghorn habitat. House Rock Valley is in the rain shadow of the Kaibab Plateau, so forage production is limited. Rangeland managers should carefully consider stocking rates and seasons of use as they directly affect forage availability and fawning cover for pronghorn. Northern House Rock Valley has been identified as being severely overgrazed.

Miles of fences do not meet game standards and restrict pronghorn movement and survival. Most of these non-game standard fences occur in northern House Rock Valley.

There are also some unnecessary fences due to the division of grazing allotments into small pastures. A fence inventory should be conducted in House Rock Valley to identify specific fences needing modification or taken down. Interior fencing on the House Rock Wildlife Area has already been taken down to increase pronghorn movement. About 75 miles of wire fencing was removed.

Coyote predation on fawns has been identified as a probable limiting factor to pronghorn recruitment, especially during prolonged drought periods when fawning cover is limited. While predator control has been proven to work over the short term, it must be maintained to be effective, which is usually cost prohibitive.

While illegal harvest has not been documented in this area, the illegal harvest of other game species in the area has been documented and would lead one to believe that there is illegal take on this pronghorn population. Because of this population's size, illegal take could substantially

limit this population's productivity.

Increase in human disturbance not only degrades the habitat, it can also affect fawn survival. Fall (hunting season) and spring (shed antler "hunting" season) are the times of highest use. However, House Rock Valley receives little pressure due to its remote location. Currently, only BLM lands restrict off road travel.

House Rock Valley has an adequate supply of year round water sources. A water source was within 2-6 km of most of the suitable habitat. The primary source is a water line that feeds multiple tanks on Forest Service and Department properties (southern part of House Rock Valley). There are also year round water sources on BLM land, however these waters are maintained for livestock use and some have non-game standard fencing surrounding them.

Management Objectives:

- Tree-shrub encroachment
 - Identify key areas of sagebrush encroachment and implement management strategies to restore those areas to historic grasslands. Southern House Rock Valley has already been identified as an area with large monotypic stands of sagebrush that is in need of reclamation. Suggested management strategies for this area include prescribed burns and/or mechanical removal.
- Livestock grazing strategies.
 - Coordinate with public land stewards and their permittees to incorporate healthier rangeland techniques to address the issues of plant diversity, adequate forage, and fawning cover. These changes along with a prescribed fire regime have been identified as ways to increase plant diversity and promote the growth of native plants. Monitor habitat conditions and request the removal of livestock when allowable use has occurred or habitat conditions cannot support use by livestock such as in prolonged drought periods.
- Fences.
 - Complete a fence inventory for House Rock Valley and use data to implement fence modifications. This inventory should include the right of way fence along Highway 89A that bisects pronghorn habitat in the valley. Unnecessary fences should be taken down.
- Augmentation.
 - Use transplants when opportunities arise to maintain a viable pronghorn population.
- Predation.
 - Promote the recreational opportunities for coyotes in House Rock Valley.
- Illegal harvest.
 - Continue law enforcement patrols to deter illegal take.
- Recreation

- Enforce Off-Highway Vehicle laws to eliminate the propagation of wildcat roads, damage to vegetation, and to reduce animal disturbance.

Units 13A, 13B, and 12B West

Background and History:

Pronghorn were historically present in the Great Basin Grassland plant communities in the Clayhole Valley, Antelope Valley, Lower Hurricane Valley, and Upper Hurricane Valley areas in Units 13A and 13B. This species was extirpated from these areas in the late 1800s.

In 1961, following a habitat evaluation of the area, the BLM and Department reintroduced 34 pronghorn south of Antelope Valley near June Tank in Unit 13A. Subsequent releases occurred in 1965 and 1971. By 1977, the herd had established in the unit and had increased to levels appropriate to allow the first sport hunt. Five permits were authorized. The pronghorn herd in Unit 12B (west side), is believed to have come from the 13A herd. The 12B West herd has always been small, with no more than 20 individuals being observed.

In 1979, 84 pronghorn were released into historic habitat in Unit 13B near Diamond Butte in Lower Hurricane Valley. Other releases during the early 1980s helped augment this population which increased to a point where the first sport hunt was offered in 1989 and five permits were authorized.

Since reintroduction, pronghorn populations have been cyclic in these units. Pronghorn numbers have increased and decreased in a direct relationship to precipitation. During periods of drought, poor fawn survival results in low recruitment. Conversely, during normal to above normal precipitation years, fawn survival and recruitment increase.

Habitat Description:

Unit 13A

- Total Area: 1,949 mi².
- Suitable pronghorn habitat: 869 mi² with 668 mi² of medium to high quality habitat.
- Land ownership is dominated by the BLM with a small percentage of private and State lands. The Kaibab Paiute Indian Reservation occupies a relatively small portion of pronghorn habitat in the northeast portion of the unit.
- Pronghorn habitat in Unit 13A consists primarily of Great Basin grasslands with areas of sagebrush, juniper, and shrub encroachment.

Unit 13B

- Total Area: 3,127 mi²
- Suitable pronghorn habitat: 407 mi² with 212 mi² of medium to high quality
- Land ownership is dominated by the BLM with a small percentage of private and State lands.
- Pronghorn habitat in 13B consists primarily of Great Basin grasslands with areas of sagebrush, juniper, and shrub encroachment.

Unit 12B (West Side)

- Pronghorn habitat is a very small, fragmented section southeast of the town of Fredonia and

an area known as Johnson's Run.

- Habitat is rated as moderate to low quality, with none rated as high quality habitat.
- Land ownership is dominated by the BLM with a small percentage of private and State lands.
- Pronghorn habitat in the west side of 12B consists primarily of Great Basin grasslands with areas of sagebrush, juniper, and shrub encroachment.

Management Concerns:

Coyote predation on fawns has been identified as a probable limiting factor to pronghorn recruitment, especially during drought periods when fawning cover is limited or absent.

Many miles of fence do not meet game standards and restrict pronghorn movement and survival. In 2002, a fence inventory was conducted to identify and map unsuitable fences. This project was completed in pronghorn habitat in Unit 13A, and partially completed in Unit 13B. Past livestock management practices have created small pastures, resulting in a proliferation of fences in pronghorn habitat. This restricts pronghorn movement and use of suitable habitat. US Highway 89A bisects the Unit 12B pronghorn population. Several pronghorn have been killed trying to cross the highway.

Excessive grazing is detrimental to pronghorn habitat. Rangeland managers should consider stocking rates and seasons of use as they directly impact forage availability and fawning cover for pronghorn.

Water is a limited resource in the area with few year round waters available for pronghorn use.

Sagebrush and juniper encroachment into historic grassland areas are reducing-degrading available pronghorn habitat, increasing predation, and effectively blocking travel corridors.

Increasing human activity in pronghorn habitat impacts plant communities, pronghorn use of available habitat, and causes increased disturbance of animals.

The illegal take of pronghorn has been documented in this area and if uncontrolled can reduce or potentially extirpate the population.

A pronghorn hunt currently takes place on the Kaibab Paiute Indian Reservation located in northeast Unit 13A. Pronghorn in this area are likely transitory, using habitat on Reservation land and adjacent habitat off the Reservation.

Management Objectives:

- Predation
 - Continue coyote control measures when appropriate to increase fawn survival and to meet management objectives. Control measures should be accomplished through contacts with Wildlife Services. Restore the historic grassland communities.
- Fences.
 - Complete fence inventories for 13B and 12B and use data to implement fence modification projects throughout all units. Encourage large pasture sizes to decrease

the total miles of fences within pronghorn habitat. Remove unnecessary and unmaintained fences.

- Grazing.
 - Incorporate better range management techniques to address issues with adequate forage and fawning cover availability. Monitor habitat areas occupied by pronghorn and remove cattle when allowable use has occurred.
- Water availability.
 - Increase-maintain year-round water availability and distribution throughout pronghorn habitat, identify key use areas, and modify grazing practices to increase fawning cover and forage availability around water. Modify fences around all waters to ensure safe access for pronghorn.
- Tree-shrub encroachment.
 - Identify key areas of juniper and sagebrush encroachment, and implement management strategies to reverse this process to restore historic grassland communities.
 - Identify historic travel corridors and reopen them through the removal of invading shrub and tree species.
- Illegal harvest.
 - Continue law enforcement patrols to minimize illegal harvest of pronghorn in both units.
- Augmentation.
 - Use transplanted animals when appropriate to maintain a viable pronghorn herd.
- Tribal harvest.
 - Coordinate with Kaibab Paiute Indian Reservation officials to document harvest levels and discuss pronghorn management issues.

REGION III

Unit 10

Population Information:

The long-term average for fawn survival in Unit 10 equals 33 fawns per 100 does. Fawn survival averaged 45 fawns per 100 does from 1947-1971, during the time when predator control was practiced. Fawn survival from 1972 to the present, the post predator control era, equals 23 fawns per 100 does. Unit 10 has historically experienced fawn to doe ratios below guidelines and has exceeded guidelines during only 3 years since 1973.

The Department desires to maintain a population of between $3/4$ to $1\frac{1}{2}$ adult pronghorn per mi^2 of habitat, or from 1,350 to 2,700 post-hunt adult pronghorn in the unit, with a desired harvest of between 100-150 bucks annually. Populations are generally much lower than potential due to long term dismal fawn survival. Conversely, the full potential for pronghorn may well be much higher than the upper limit of the desired population. The simultaneous double count method survey has been flown with which a density estimate can be obtained and extrapolated for a population estimate in the unit. This estimate has remained around 1,200 pronghorn.

Population Distribution:

Although there are a number of ranches in Unit 10, most of the unit's pronghorn population is located on the 2 largest ranches in the unit. The Big Boquillas Ranch is located in the western half of Unit 10, accounts for about 50% of the entire unit, and contains about $3/4$ of the unit's pronghorn habitat and population. This is the largest and the single most important ranch for pronghorn in Unit 10.

A portion of the Babbitt Ranch is located in the east-central part of Unit 10. The Unit 10 portion of the ranch covers about 184,000 acres, accounts for 12% of the entire unit, and is composed of about 114,000 acres of deeded private land and 70,000 acres State lease. The Babbitt Ranch has been a voluntary participant in efforts to research problems limiting pronghorn populations as well as implementing habitat improvements specifically for pronghorn such as fence modifications.

Specific Concerns:

Juniper encroachment: Clear junipers from grassland areas, especially younger trees and leaving a scattering of older trees for shade; more dense stands may be needed for protection from very bad weather.

Water development: Year round availability or access to water should be pursued. Some corrals are made pronghorn proof; modify with cooperation of management agency and/or private landowner.

Fencing: Modify fences to allow free passage of pronghorn. Some work has been completed listing "sheep fence" throughout Unit 10. This work needs to be re-visited and completed.

Controlled burning: Will be evaluated as a tool for improving habitat conditions and/or reducing shrub invasion.

Management Objectives:

Predation management through aerial control of coyotes.

Unit 15A and 15B

Population Information:

The objective for Units 15A and 15B is to maintain a population of between 70 and 100 post-hunt adults and to have an annual harvest of between 2 to 3 animals. These goals will be more difficult to reach as habitat losses reduce the Department's ability to effectively manage pronghorn and their habitat in the area.

Population Distribution:

The pronghorn herd in this unit is distributed among four areas: in grasslands west of Hackberry road, portions of the Hualapai Valley, north and west of the town of Truxton, and on top of the Music Mountains in areas north and east of Grapevine Canyon. Because of the mixed land ownership, cooperative management options between landowners, land management agencies, and the livestock permittees are essential. Management actions should address effects on populations that are confined in small areas resulting from developments in pronghorn habitat that isolate herds.

Specific Concerns:

Habitat: The primary challenge to pronghorn management in Units 15A and 15B is the continued degradation of habitat that is rated only as moderate. Some habitat in this area has not been deemed significant in the long-term survival of pronghorn in northern Arizona (Hualapai Mountains Land exchange EIS). Every portion of pronghorn habitat should be considered extremely valuable and each portion significant for the prolonged maintenance of these small populations. This issue is compounded by the consortium of permittees and land managers. With land ownership consisting of state trust, BLM, and private lands, working through issues will demand cooperation among all parties involved.

Water development: Loss of water sites due to development, drought conditions, and the placement of livestock troughs within waterlot fencing. Pronghorn are reluctant to use fenced waters, which can provide an opportunity for entrapment and predation. Location, quality, and reliability of waters in pronghorn habitat need to be established. Working through the Kingman HPC, waters need to be developed and/or improved in areas where needed.

Fencing: Fence crossings were installed along the Hualapai Indian reservation in July 2000 to enhance movement and compensate for loss of habitat to 40 acre lot development in the immediate area. These fence crossings need to be monitored.

Land Exchange: Past land exchanges have disposed of public lands eliminating potential pronghorn habitat. Efforts to minimize these exchanges where pronghorn habitat is lost and to

mitigate them to the greatest extent possible are necessary for the long-term persistence of these populations.

Habitat Project: Follow-up and evaluate the 7 proposed multi use exclosures in Hualapai Valley to describe impacts of grazing on wildlife habitat. Studies should include determining range condition, trend, potential and habitat rate recovery (Cerbati-Music Habitat Management Plan).

Management Objectives:

- Game Management:
 - Explore the possibility of supplemental transplants into areas with isolated populations and use surplus animals from other areas.
 - Continue muzzleloader and archery hunts to accommodate developed areas.
 - Establish more accurate estimates of sub-unit pronghorn populations.
 - Evaluate movement of pronghorn on to Hualapai Indian Reservation and into adjacent game management units.
- Habitat Management: Develop comprehensive grassland ecosystem management plan with land management agencies, NGOs, and landowners to improve specific blocks of pronghorn habitat.

Unit 17A

Population Information:

Pronghorn have been surveyed in Unit 17A since at least 1957, at which time survey data were combined with 17B and 19B. Unfortunately, Unit 17A data were not separated until 1973 and the New Water data were not separated out until 1983. Pronghorn have been hunted in Unit 17A since at least 1958, when the unit was again combined with Units 17B and 19B. Starting in 1989, Unit 17A was removed from the multi-unit hunt structure and has stood alone as a separate hunt since. Maintain a population of 125-175 post-hunt adult pronghorn with an annual harvest of five bucks and the majority of these animals residing in the New Water area of the unit.

Population Distribution:

The pronghorn located in Unit 17A are primarily found in three distinct areas: 1) A small amount of pronghorn habitat is located in the *southeastern corner* of Unit 17A on the Las Vegas Ranch. Ten to twelve pronghorn regularly use this area and likely move in and out of Units 19B to the east and 17B to the south. The southeastern corner of 17A is a mix of deeded private and State Trust land; 2) Pronghorn use habitat in the *southwest corner* of 17A intermittently. This area offers fragmented grasslands that suffer from heavy tall shrub and tree invasion. These pronghorn spend most of their time to the north and west in Unit 18B; and 3) The Yavapai Ranch takes in roughly the northern half of Unit 17A including New Water. The New Water area, which accounts for the majority of pronghorn habitat in 17A, is located in the northwestern portion of the unit. New Water is not a closed population and substantial movement is known to occur between Unit 18B to the south and west and Unit 18A to the west and north. Pronghorn habitat loss, caused by development to the west and north, will increase the importance of the New Water area and the Baca Float to the south. A land trade proposal with the Yavapai Ranch is currently under consideration, which would result in a large portion of the pronghorn habitat in the New Water area becoming Forest Service lands if accepted in its current form.

Management Objectives:

- Habitat Management:
 - Sections of land within Unit 17A are at risk for potential urban development pending the outcome of a proposed land trade between the Yavapai Ranch and Prescott National Forest. Pursue opportunities to protect pronghorn habitat when compatible with other Department objectives and funding.
 - Border fences along southwest corner of Yavapai Ranch (New Water) are not to wildlife specifications - work with Yavapai, ORO, and OO Ranches and modify fence by either re-stringing bottom two strands of wire or installing "goat bars."
 - Grazing sometimes occurs on grassland within Yavapai Ranch prior to and during critical pronghorn fawning period – work with Yavapai Ranch and Prescott National Forest Range Program to develop a grazing strategy that defers grazing on grasslands until after May 15th.
 - Work with landowners to ensure continued access to Unit 17A. Protect and enhance habitat and travel corridors by working with landowners and land management agencies.
- Game Management: Apparent high level of predation by coyotes, ravens, and mountain lions in New Water portion of Yavapai Ranch.
 - a) Encourage individual sportsmen and varmint calling clubs to hunt coyotes in this area through information and education efforts.
 - b) Encourage local sportsman (houndsman) to hunt mountain lions in this area through information and education efforts.

Unit 18A

Population Information:

The Department desires to maintain a population of between 400-700 pronghorn in Unit 18A with a desired harvest of between 15-40 bucks annually. Pronghorn located in Unit 18A are primarily found in six more or less distinct areas. The areas are: 1) the Chino Wash Drainage; 2) the Aubrey Valley; 3) the 74 Plains (including Munds Well Flat and the Red Lake Drainage); 4) Denny Ranch; 5) Truxton Flat; and 6) Round Valley. All of the areas are now mostly open to pronghorn harvest. All areas have also shown a decline in population numbers in recent years. At this point in time, subdivision development may reduce hunting opportunity as much as population trends.

Population Distribution:

About 48% of Unit 18A is private land. Most of the Unit 18A pronghorn population is located on the Double O Ranch (the ranch accounts for 40% of the pronghorn habitat and a little over half of the unit's pronghorn population), the X Bar One Ranch (owners of the ranch have chosen to block access to hunters on all private land portions of the ranch in an attempt to run a guided hunting operation. The X Bar One Ranch contains one block of about 25 sections of State Land that is undeveloped; this block of land is probably a big enough area to ensure the future of a

pronghorn population and limited hunting into the future), and BLM lands on Truxton Flat (Crozier Allotment). There are smaller amounts of pronghorn habitat on the Denny Ranch, Echeverria Ranch, Fort Rock Ranch, and Cofer Ranch; this habitat is still of importance to pronghorn but it appears to be used more in the winter than in the summer.

All or parts of the following ranches have been subdivided and sold: Blake Ranch, Cofer Ranch, Double O Ranch, Denny Ranch, Echeverria Ranch, Fort Rock Ranch, Miller Ranch, Willows Ranch, Windmill Ranch, and the X Bar One Ranch.

Management Objectives:

Habitat Management: issues here similar to Unit 10. One change specific to Unit 18A would be that Truxton Flat, the block of State land on the 74 Plains and the Chino Wash area near the Double O Ranch HQ should be protected as much as possible as these are the only areas left in Unit 18A that will be undeveloped in the not too distant future.

Unit 18B

Population Information:

Since the early 1950s, the Unit 18B pronghorn population has had a peak post hunt population estimate of over 500 pronghorn and a low estimate of fewer than 100. The population reached its peak in the late 60s and its low in the early 90s. The populations have been influenced primarily by weather conditions, range conditions, and predation. Unlike many other habitats in the Kingman region, the Unit 18B pronghorn populations are not significantly impacted by urban sprawl.

Pronghorn Distribution:

Most of the area is used as grazing land for livestock. Livestock grazing has deteriorated range conditions and pronghorn habitat in the area. Goodwin Mesa comprises most of the pronghorn habitat in 18B. Land ownership is almost entirely BLM with two small private parcels are owned by the SV Ranch. The Bartmus Flat-The Island area is located north of Goodwin Mesa and encompasses portions of the southern and eastern boundary of the Wagon Bow Ranch, the western boundary of the Mohon Ranch, and the northern and eastern boundary of the SV Ranch. Although the majority of habitat in this area is closed to the public, the Department continues to survey pronghorn because the area serves as a travel corridor between the Anvil Rock and Goodwin Mesa populations. The Bozarth Mesa area comprises the second largest concentration of pronghorn habitat in the east central portion of the unit. Most of the area is used as grazing land for livestock. The Windy Ridge-Strotjost Flat area comprises the highest density of pronghorn east of Burro Creek. This area encompasses portions of the Yolo Ranch and the 7up Ranch; the Yolo Ranch manager's headquarters is located in this area. Behm and Contreras mesas account for a small population of pronghorn and is located south of Windy Ridge and east of Bozarth Mesa. The Anvil Rock Ranch area is located in the northern most portion of the unit, north of the Baca Float. Sanders and Nelson mesas are located just north of the town of Bagdad on the Kellis Ranch near the Bagdad Airport. The area is used only when pronghorn are forced off of Bozarth, Behm, and Contreras mesas during extreme winter conditions.

Management Objectives:

- Habitat Management:
 - Construction of additional waters.
 - Fence modification.
 - Juniper treatments (e.g. agra-axe, pushes, burns, chainings, herbicides and cuttings) to maintain existing and open past grassland habitat.
 - Reconnect scattered sections of pronghorn habitat by opening travel corridors through the removal of trees (junipers).
 - Burn or remove dead and down tree piles.
 - Small scattered burns to increase species diversity.
- Game Management:
 - Aerial gunning to control predators.
 - Encourage coyote hunters and trappers through information and education efforts.
 - Pronghorn herd supplementation.
 - Supplemental feeding coyotes during critical fawning period.
 - Supplemental feeding pronghorn during times of high nutritional requirements.
- Research:
 - Cumulative effects of multiple predators (mountain lion and coyote) on the long-term survival of a pronghorn population relative to populations with only one significant predator (coyote).
 - Comparison of pronghorn use between two adjacent ranches with different management strategies.
 - Vegetative analysis of habitats that are currently preferred vs. nonpreferred.
 - Identify current grazing practices and impacts on preferred browse plants.
- a. Mitigation Opportunities:
 - Private property developers maintain travel corridors for pronghorn.
 - If existing waters are lost to development, new waters shall be created for pronghorn use.
 - Vegetation treatments (juniper eradication) of areas equal in size to area being lost, resulting in no net loss of pronghorn habitat.
 - Limitations on road development within areas of pronghorn use (grasslands).
 - Any changes in public land grazing plans shall incorporate the annual and seasonal habitat requirements of pronghorn.
 - Avoid any additional fence construction, but if necessary, it should meet Department criteria to allow for pronghorn movement.

Units 17B, 19A, and 19B – Central Yavapai County Herd

This section describes administrative boundaries and pronghorn habitats in the Prescott, Prescott Valley, Chino Valley, and Paulden areas, collectively known as Central Yavapai County in north central Arizona. The Central Yavapai County unit is comprised of three units: 17B, 19A, and 19B. The unit contains about 2,191 mi² of land; of this, about 1,362 mi² is habitat occupied by pronghorn. Of pronghorn habitat ranked as high quality statewide, about 30% is contained in

this unit. The Central Yavapai County area supports one of the highest density pronghorn populations in the State; about 15-25% of the statewide pronghorn population.

Central Yavapai County Unit Goals and Objectives:

- Maintain all viable populations of pronghorn in this unit.
- Maintain or increase hunting opportunity.
- Protect and develop movement corridors.
- Use existing healthy or dwindling populations for translocation efforts.
- Use area as a public education tool regarding pronghorn issues.

Population Information:

Unit 17B: Pronghorn have been surveyed in Unit 17B since at least 1957; however, survey data were combined with 17A and 19B until 1973. Desired annual harvest is 5 to 8 bucks. Additional bucks are available for harvest; however, access restrictions on private property are limiting. Pronghorn numbers during the past 30 years was highest from 1986-1989. The target population of post-hunt adult pronghorn in 17B is 150 to 225 animals.

Unit 19A: Pronghorn are abundant and occupy much private land.

Unit 19B: Pronghorn survey data has been collected in Unit 19B since 1961. Pronghorn numbers ranged from 1066 in 1988 to a low of 602 in 1996. Prolonged drought in 1996 is implicated in the population decline. Population estimates generally coincide with survey data collected in this unit.

Population Habitat and Distribution:

Unit 17B: Most pronghorn in 17B are located primarily on deeded private land within the Las Vegas and Long Meadow ranches. These pronghorn move along north-south routes between Unit 17A, and along west-east routes into Unit 19B. A limited amount of pronghorn habitat is present on adjacent ranches. The Bar U Bar Ranch lies directly south of the Long Meadow Ranch and provides a small amount of pronghorn habitat. The Yolo Ranch is a large ranch located in the northwestern 17B, southwestern 17A, and eastern 18B with a small amount of habitat (juniper encroachment compromises its' quality). Tank Creek Mesa (located within the Indian Rock Ranch) in south-central 17B and Strotjust Flat in the northwestern corner also contain pronghorn habitat but are limited by lack of water and deteriorated habitat conditions due largely to shrub and tree encroachment. Continued development and the associated traffic volumes on Williamson Valley Road increasingly impact pronghorn movement patterns described above.

Unit 19A: The majority of pronghorn habitat in Unit 19A occurs on six ranches; the Fletcher Ranch, Perkins Ranch, Wells Ranch, Deep Well Ranch, Granite Dells Ranch, and Fain Ranch. Several large pastures on the Fletcher ranch were ranked as high quality pronghorn habitat, but year-round water sources are limited in these pastures. Perkins Ranch, situated in the northern portion of Lonesome Valley, contains 9,600 acres of private and 1,300 acres of State Trust Land is currently for sale. Wells Ranch is located along the eastern edge of Lonesome Valley and is a checkerboard pattern of private and State land. A portion of the Deep Well Ranch is located on the western edge of Lonesome Valley along US Highway 89. Granite Dells Ranch is located

roughly in the center of Lonesome Valley and extends south across US Highway 89A to Glassford Hill. This ranch contains extremely high quality pronghorn habitat, but subdivision is proceeding rapidly. Fain Ranch is located south of US Highway 89A and east of Prescott Valley.

About 1,150 post-hunt adult pronghorn inhabit Unit 19A in eight distinct sub-populations. The Orme population resides north of Cordes Junction, between State Route 69 and I-17. The group is threatened by isolation from larger herd units and habitat to the east in Unit 21 by I-17; and from the Lonesome Valley area to the west by State Route 169 expansion. An additional 20-30 animals (Cherry subpopulation) reside north of State Route 169 and west of I-17 on Prescott National Forest; the herd similarly has limited connectivity with animals in the Verde Valley. Juniper encroachment also jeopardizes this group.

The Fain Ranch subpopulation is functionally isolated from other pronghorn groups by US Highway 89A to the north, Prescott Valley to the west, Mingus Mountain to the east, and State Route 169 to the south. This herd comprises the majority of pronghorn found in 19A (currently about 275 animals). Fain Ranch is bisected north to south by two double fenced roads connecting US Highway 89A and State Route 69. One of these roads is currently under construction and will have a large volume of high-speed traffic. This small herd continues to use undeveloped areas within and around the municipal boundaries of Prescott Valley; but these animals are also functionally isolated. Continued urban development will eliminate remaining habitat and eliminate the remainder of this herd. Translocation should be a priority.

The Antelope Hills subpopulation occupies the lower north slope of Mingus Mountain in the vicinity of the Phoenix Cement Plant. This small group is decreasing in numbers, and is currently part of a study to determine movement corridors and population interchange. Land status is private and National Forest. Pronghorn occupy a small area of habitat seasonally on Little Black Mesa. Pronghorn possibly use this area as a movement corridor between Lonesome Valley and areas north of the Verde River.

Glassford Hill is an extension of Granite Dells Ranch south of US Highway 89A. US Highway 89A to the north, Glassford Hill Road to the east, and State Route 69 to the south isolate pronghorn occupying the Glassford Hill area. Land status is State and private. Historically, as many as 175 pronghorn may have occupied this area, however the 2002 survey data indicated about only 30-40 pronghorn occupy the area. The area was removed from the 19A archery hunt structure in 2002. A pronghorn population in Lonesome Valley is confined by US Highway 89A to the south, Mingus Mountain to the east, US Highway 89 to the west, and the Verde River to the north. A current telemetry project has documented animal movement into this area from north of the Verde River. Land Status is predominately private and State. Pronghorn do occupy some National Forest land to the north and east.

Unit 19B: Most pronghorn habitat in Unit 19B occurs on three large ranches: The K-4 Ranch is located in Big Chino Valley and occupies the southwestern half of the unit, the CV/CF Ranch is the northern portion of Big Chino Valley, and the Campbell Ranch is located in the north and northwestern portion of the unit. The majority of historic pronghorn habitat that was south of the Atchison, Topeka, and Santa Fe Railroad is now residential housing. Isolated pronghorn habitat

is still present, but most is threatened by continued subdivision. Several ranches still exist in this area and continue to provide some habitat for pronghorn. The Deep Well Ranch is semi-isolated from adjacent open grasslands due to its location between Prescott and Chino Valley proper. The Lobo Ranch and T-2 Ranch are open grassland in Big Chino Valley. Although smaller than adjacent ranches, these ranches contain important pronghorn browse that is required during drought. Juniper Woods Estates is a former ranch located southwest of Ash Fork. After the ranch's private property was sold to developers, State Trust Land was also converted to private ownership via land trade. Human occupancy varies with access, but significant damage to pronghorn habitat has resulted. The actual pronghorn use area was substantially reduced following creation of this subdivision.

The Unit 19B pronghorn herd is distributed among four sub-units: Big Chino Valley (including the Campbell Ranch), Juniper Woods Estates, Deep Well Ranch, and Willow Lake. The area north of I-40 (the Strip) is functionally isolated from other sub-units by the interstate highway, and is not included in this discussion. Distribution of pronghorn within each subunit is discussed below (subunits are listed in order of importance based on the percentage each contributes to the overall population).

The Big Chino Valley grassland valley extends northwest from Paulden to Picacho Butte and the Juniper Mountains. The area historically provided about 230 mi² of habitat. Rural residential housing now comprises 12 mi² around Paulden. Continued development on checker-boarded sections of private land significantly reduces pronghorn use on adjacent, undeveloped State Trust sections. Invasion of juniper trees into grassland habitat is also problematic. Although the Campbell Ranch lies north of this valley, it is included within the Big Chino analysis because of pronghorn use of a small grassland mesa that separates the two. Juniper management projects continue to convert woodland habitats to open grasslands on this ranch.

A subpopulation of an estimated 157 adult pronghorn inhabits the Juniper Woods Estates area. Extensive pronghorn habitat (50 mi²) extends south and west, and gradually transitions to juniper woodlands. Over the past 12 years, scattered occupancy of 40-acre lots has greatly reduced pronghorn distribution and numbers. As such, limited management opportunities currently exist with this herd and development trends will likely continue.

The Deep Well Ranch subpopulation is threatened by habitat fragmentation. Presently, the ranch is semi-isolated from adjacent open grasslands by urban infrastructure in Prescott, the Town of Chino Valley, and US Highway 89. The ranch currently supports a population of about 85 adult pronghorn.

The Willow Lake herd represents a prime example of pronghorn isolation caused by urbanization. This declining subpopulation of <50 pronghorn persists within the Prescott city limits near the Willow Lake-Prescott Lakes area in the southern portion of the unit. The herd occupies habitat that is being rapidly converted to a residential housing-golf course development. Historical dispersal or migration from this area likely influenced the number of pronghorn in the area. However, construction of two roads (and associated fencing) more than 30 years ago created the first major barrier to movement on the northern border of the area. Continued urban development has reduced habitat from 10 mi² in 1990 to less than 2 mi² in 2000. Although the

Willow Lake Park is city property, most of the remaining pronghorn habitat is private property that will be developed in the near future. The herd is frequently surveyed to monitor total numbers, sex-age ratios, and fawn survival.

Specific Concerns:

The prevailing threat to pronghorn populations in this planning unit is loss and degradation of available habitat to urban development associated with a rapidly expanding human population. Yavapai County is the fourth largest county in Arizona by population, following only Maricopa, Pima and Pinal counties. The town of Prescott Valley is the seventh largest growing incorporated area in the state, with 161.5% growth occurring between 1990 and 2000. Much of this growth has occurred in high-quality pronghorn habitat, and much more development is forecasted. Ancillary impacts to pronghorn are often common to many areas; however, others may be site specific. This section identifies threats common to multiple subpopulations, which were discussed in the introduction of this document. Threats and issues specific to the 14 subpopulations that occur in this planning unit are detailed in this section.

History of Management Actions:

Unit 17B:

- Pronghorn have been surveyed in Unit 17B since at least 1957.
- Pronghorn hunts have been held in Unit 17B since at least 1958.
- In 1963, most of the Las Vegas and Long Meadow Ranches were root plowed to remove snakeweed.
- The Las Vegas Ranch routinely employs cholla cactus removal practices.
- The Las Vegas Ranch has completed numerous juniper treatments in the past.
- Juniper treatment (cutting with hydraulic shears) near Strotjust Flat (Units 18B and 17B) scheduled for July of 2001.
- Research Branch personnel evaluated pronghorn habitat in 1995.

Unit 19A:

- Population surveys begun in 1948.
- Pronghorn hunts begun in 1941.
- Fain ranch study on Home Ranges, Movement Patterns and Habitat Selection, 1989-1994.
- Habitat evaluation Research Branch, June 1996.
- Fain Ranch Capture for translocation, January 2000.
- Attempt to drive pronghorn from K-Mart area of Prescott Valley, April 1996.
- Juniper chaining in Little Black Mesa, Del Rio Area.

Unit 19B:

- Pronghorn have been surveyed in Unit 19B since at least 1948.
- Pronghorn hunts were initiated in 1941, 1942, and 1943. There is no data for 1944-48, so possibly no hunts were conducted. Annual harvest data is available statewide from 1949 to the present.
- Juniper management has been conducted on the Campbell Ranch to increase habitat and increase movement between the Campbell Pasture and Juniper Woods Estates.

- Documentation of open space change within Yavapai County from 1988 and 1997 (USGS contract: <http://TerraWeb.wr.usgs.gov/projects/OpenSpaces/>).
- Water source mapping and classification of all waters (AGFD, Region III "Critical Waters Project") completed in 2000.
- Fence mapping and classification within Big Chino Valley (April 1996).
- Landscape-level pronghorn habitat evaluation (September 1996).

Management Objectives:

- Loss of grassland habitat to development on American Ranch (Unit 17B).
 - Work with American Ranch developers to ensure fencing is constructed to wildlife specifications thus allowing emigration of resident pronghorn.
- Loss of grassland habitat to development on Long Meadow Ranch (Unit 17B).
 - Educate new landowners as to the importance of constructing new fence to wildlife specifications to allow for movement of pronghorn.
 - Work with neighboring ranches and land management agencies to create and enhance grassland habitat adjacent to Long Meadow ranch.
- Fragmentation of habitat by paved double fenced roadways in Unit 19A.
 - Participate in the roadway planning process to align paved roadways in a way that minimizes fragmentation of key habitat
 - Ensure right-of-way fences meet or exceed wildlife specifications. Use gap fencing, overpasses or other measures to allow pronghorn to cross paved roadways.
- Annexation of northern Lonesome Valley by the town of Chino Valley.
 - Work with city planners to pursue mitigating measures such as land exchanges or conservation easements to maintain large blocks of grassland habitats.
- Expansion of Prescott Valley into Fain Ranch.
 - Work with city managers to plan development in a way that does not fragment or isolate blocks of habitat.
- Range Conditions-Fawning Habitat.
 - Work with livestock operators to manage grazing in a way that maximizes cover during fawning period in key fawning areas.
- Mortality of adult pronghorn on newly opened or widened roads, specifically the new section of US Highway 89A and the soon to be opened Fain Road alignment.
 - Work with ADOT and the county or have pronghorn crossing signs installed at key locations. Ensure right-of-way fences are built to pronghorn specifications and have setbacks at key locations.
 - Investigate ways to keep monsoon runoff from creating green-up along roads during drought conditions – supplemental feedlots and watering stations?
- Create and enhance grassland habitat and travel corridors by working with landowners and land management agencies.

REGION V

Unit 28 (Day Ranch)

History:

This population is bisected by the Arizona-New Mexico border. Most pronghorn in this population reside in New Mexico, but a few bands totaling 20-30 animals are consistently located in Arizona east of the Peloncillo Mountains. The population was estimated at 20-25 in 1966, and at less than 20 in 1973. Because of its small size this population is not surveyed aerially each year. A supplemental transplant in 1986 added 36 Texas pronghorn to this population.

Population Information:

This is the largest contiguous area of suitable pronghorn habitat in Unit 28. In December of 1986, 36 pronghorn antelope were released on the Lazy-B ranch in Unit 28, along the New Mexico border south of Duncan. Survey flights were conducted in this unit each year, between 1993 and 1998, however, a relatively low number of animals were observed each year. During these yearly flights, the average observation was 18 antelope. This is far below the estimated 200 animals the area was thought to be able to support. In 1999 it was decided that no annual fixed wing surveys would be conducted. In 2004, a survey was conducted and 10 animals were observed (2 bucks, 7 does and 1 fawn). December 7, 2006 a winter survey was completed to survey the population when they are in more gregarious. Only 2 bucks and 11 does were seen on that survey. Due to the small overall population size, no antelope hunt currently takes place in Unit 28.

Specific Concerns:

According to the Statewide Pronghorn Habitat Evaluation, forage diversity is lacking in this area. In some areas shrubs are high and dense enough to hinder pronghorn visibility and escape, but for the most part are not yet a major problem. Development is minimal and consists of ranch headquarters and airstrip, livestock facilities, and low-use, dirt roads, scattered homes, pipelines and power lines. The BLM has a designated rock hound area, with a primitive campground in the eastern side close to the border. Waters are abundant and most are easily accessible.

Livestock fences are minimal in Unit 28 and the only area where they would be a major concern would be the grassland area south of Duncan. Not game, game standard, and electric fences are found in this grassland, but pastures are large and these fences are probably not a major problem at this time (Ockenfels et al. 1996). However, pronghorn currently use this area and therefore, not game standard fences should be identified and modified, especially before reintroducing pronghorn into new areas.

An overall concern is the lack of enough habitat to support a large population of pronghorn on the Arizona side of the state line. This is not something that can be overcome and we will just have to work with what we have. There are areas of intensive grazing locally causing degradation of habitat quality. If the population is as low as indicated (and has been at a low level for some time), then the lack of genetic diversity and inbreeding depression will be a suppressing effect on this isolated population.

Management Objectives:

- Maintain pronghorn habitat and travel corridors through cooperation with land management agencies and private or other landowners.
- Evaluate and modify livestock fences to pronghorn specifications.
- Greater use of controlled burning to restore grassland habitat and increase plant species diversity.
- Encourage predator management by private landowners and sportsmen.
- Encourage non-governmental organizations, such as The Arizona Antelope Foundation and The Nature Conservancy, to participate in grassland conservation and management.
- Avoid any additional fence construction, but if necessary, it should meet Department criteria to allow for pronghorn movement (wildlife specification fencing).
- All public and state lease lands must maintain water sources year round. During drought conditions, water must be left in earthen tanks for wildlife.
- If existing waters are lost to development, new waters should be created for use by pronghorn.
- Any changes in public land grazing plans shall incorporate the annual and seasonal habitat requirements of pronghorn.

Unit 30A (San Bernardino Valley)

History:

This large block of excellent pronghorn habitat once teemed with antelope, but remained vacant for many years after being extirpated around the early 1900s. Long-term residents in the valley reported that pronghorn persisted until around 1910 near the settlement of Apache. In November 1984, 32 antelope from west Texas were released in the San Bernardino Valley. These animals were supplemented with 67 more from the same source in December 1986.

Population Information:

After good fawn recruitment in the early 1990s, this population built up to be the most robust in the Southeastern Arizona. A hunt was initiated in 1992 with 2 General permits. Because of trends in population indices and buck:doe ratios, the number of permits was increased to 5 for the 1993 season and then to 10, before dropping down to 6 in 2001. Fewer than 91 animals were observed on surveys prior to 1991. More than 150 were observed from 2002 to 2005, but then survey totals began to decline with only 73 seen in July 2007.

Specific Concerns:

Valley vegetation is reduced in species richness, tobosa dominated, semidesert grassland, but with some areas of good vegetative diversity. Good habitat is also present on the northern side of the Tex Canyon Road in Unit 29. Unfortunately, pronghorn seldom, if ever, use this habitat because stranded fence along State Route 80 impedes or prevents movements across. This entire grassland appears to have the potential for greater vegetative diversity, given adequate precipitation. The vegetation in the peripheral foothills of the surrounding mountains merged into a closed canopy shrubland dominated by mesquite, acacias, and creosote. These tall shrubs are slowly invading this grassland and without some form of shrub will eventually dominate the valley. The southern end of this grassland turned into a closed canopy shrubland within 8 km of

the Mexican border, including the San Bernardino National Wildlife Refuge (Ockenfels et al. 1996).

The San Bernardino Valley will eventually be shrub invaded, if current shrub encroachment is not kept in check. Pronghorn habitat in the San Bernardino Valley could be expanded to include the western side of the mountains, if shrubs were pushed back between the southern end of the Pedregosas and the northern end of the Perillas to allow pronghorn to use the grasslands along US Highway 191.

These shrub invasions are likely the result of long-term fire suppression and inappropriate livestock use. Shrub invasion can be controlled and dense stands pushed back by using controlled fire, chemical treatments, and cabling, root plowing, or chaining.

Livestock fences are abundant and are not game standard. Fence densities are high near ranch headquarters. State Route 80 is fenced on both sides with not game standard fences. Currently, State Route 80 is the only highway affecting pronghorn movements, because pronghorn have not been re-established in other areas of the unit.

Water sources are adequate and well distributed, but most are sometimes dry. The tank in section 23 of T23S, R30E was too tall for pronghorn to use. An extended drinker from this tank would aid pronghorn accessibility. Although waters are abundant in most areas, they are not full year round, especially during dry spells, when they would be of greatest value to wildlife. Maintaining waters in this valley is necessary for fawn survival, since droughts most likely occur during fawning season.

Low species richness was prevalent in most of the grassland areas, probably due to fire suppression and inappropriate livestock use, compounded with lack of precipitation. We believe that grass and short-shrub diversity of the San Bernardino Valley would increase in response to precipitation, if fire and grazing were used as tools to restore the grasslands. Appropriate livestock grazing plans for the precipitation levels would greatly benefit vegetative diversity.

Management Objectives:

- Work with landowners to ensure continued access to these areas to the greatest extent possible.
- Identify and recommend specific travel corridors to Cochise County Planning and Zoning to avoid predicted herd isolation.
- Evaluate and improve wildlife water distribution.
- Gap fencing along highways.
- Greater use of controlled burning to restore grassland habitat and increase plant species diversity.
- Cooperate with non-governmental organizations, such as The Arizona Antelope Foundation and The Mapais Group, to participate in grassland conservation and management.
- All fences in the San Bernardino Valley, including the Geronimo Road, should be modified or removed to facilitate pronghorn movements.
- Provide landowners information about conservation easements to protect grasslands from housing developments to maintain their ranching heritage.

Unit 31/32 (Sulphur Springs Valley north of Willcox)

History:

The antelope were once very abundant throughout the entire valley, but now inhabit the grassland north of Willcox, east of the Galiuro and Winchester Mountains and west of the Pinalenos. A portion of the population also ranges on Allen Flat to the southwest of the Winchester Mountains. Raymond Wildlife Area-Chavez Pass antelope were released here (22 in 1943, 6 in 1944, 40 in 1945). In 1954, the Sulphur Springs and San Rafael valleys were open to legal hunting with 50 permits issued. Pronghorn seasons in southern Arizona were closed again 1955-57 and reopened in the Sulphur Springs Valley in 1959 with 20 permits.

Population Information:

Throughout the mid-1990s more than 200 pronghorn were seen each year on surveys. In the last 8 years, less than 100 were seen in most years during standard summer aerial surveys in the same areas. The number of firearms permits have been reduced from 15 to 4 in the last 10 years. This population has declined in recent years.

Specific Concerns:

This area has highways along its eastern and southern sides (US 191 and I-10), and these roads restrict pronghorn movements, isolating them from suitable habitat in Unit 28 to the east and 30A to the south. Pronghorn can move between units 31 and 32 in a narrow band of habitat at the northern end of the valley, where low and moderate quality habitat exists in both units. However, it would be difficult to access Unit 31 at the southeastern end, because of agriculture, fences, and development.

Southwest of the Allen Flat area, fences are not as abundant. These fences are not game standard and modifying them to game standard would enhance these areas for pronghorn, by permitting easier movements to better forage and available water. An area in Allen Flat is currently being subdivided into home sites.

Tanks may dry up during droughts in this area when water is needed most. Year-round waters should be made available to pronghorn, especially during spring when pregnant does may leave good fawning habitat without water for areas of lesser quality with water. This lack of water could lessen fawn survival. Many of the water sources in the grasslands south and southeast of the Pinaleno Mountains are located in or near washes, but these washes, even in otherwise open areas, are usually surrounded by thick mesquite. These tall, dense shrubs and small trees may reduce pronghorn use of otherwise accessible waters. Tall shrub removal around these tanks would greatly improve them for pronghorn use.

Most of the historical grassland areas in this unit have been lost to shrub invasion. Shrub invasion was likely the result of long-term fire suppression, coupled with rangeland practices inappropriate for the arid conditions. In the southern end of this unit, invasive shrubs, such as snakeweed, yuccas, and shrub-form mesquite, are rapidly invading the remaining grassland areas.

Decreased species richness was also a problem in this valley, with historical uses and abuses resulting in poor rangeland diversity, with numerous invasive shrubs in some areas.

Prescribed burns and an appropriate livestock grazing plan are necessary to prevent the remaining grasslands in this area from becoming shrublands, like the rest of this unit. Fluctuations in local precipitation must be considered when determining livestock stocking rates, and timing and duration of use. Coordination with permittees and land managers can determine the best strategy to improve the carrying capacity of Units 31 and 32. This would benefit pronghorn and livestock.

Management Objectives:

- Work with landowners to ensure continued access to these areas to the greatest extent possible.
- Maintaining and enhancing pronghorn habitat and travel corridors through cooperation with city and town governments, land management agencies, and private or other landowners.
- Remove shrubs along the periphery of the grassland areas to increase visibility, as well as improving forage diversity.
- Livestock grazing plans should be modified to consider fluctuating precipitation when determining livestock grazing capacities, season, duration, and timing of use.
- Prescribed burns, chemical treatments, and mechanical treatments should be used in combination to remove or thin areas invaded by shrubs.
- Identify and recommend specific travel corridors to Cochise and Graham County Planning and Zoning to avoid predicted herd isolation.
- Evaluate and improve wildlife water distribution.
- Evaluate and modify livestock fences to pronghorn specifications.
- Removal of non-functional old fences.
- Predator management to enhance fawn survival.
- Establish more accurate estimates of sub-unit pronghorn populations.
- Encourage non-governmental organizations, such as The Arizona Antelope Foundation and The Nature Conservancy, to participate in grassland conservation and management.
- Avoid any additional fence construction, especially along Fort Grant Road. If additional or replacement fence is necessary, it should meet Department criteria to allow for pronghorn movement (wildlife specification fencing).
- Coordinate with landowners, organizations, and agencies to keep viable agriculture and livestock operations in place to avoid sale and subdivision (especially in Allen Flat).

Unit 34B (Empire Cienega)

History:

The desert grassland area northeast of Sonoita supported antelope historically, but these antelope disappeared from this area north of State Route 82. In November 1981, 51 pronghorn (10B:21D:20F) trapped near Marfa, Texas where released on the Empire Ranch in Unit 34B.

Population Information:

After the release, there was some initial mortality (about 20%) and a slow reproductive start, but the population began to increase steadily before stagnating in the 1990s. Between 20 and 50 animals have been observed each year for the last 5 years during standard fixed-wing surveys. Recently, antelope have been observed consistently on the west side of State Route 83 (Unit 34A), as some animals apparently dispersed into unused (in recent times) habitat. Also, pronghorn movements across State Route 82 east of Sonoita has been reported by Wildlife Managers. In 1988, this unit was opened to legal harvest with an archery, muzzleloader, and firearms permit. This population has supported 2-3 permits for the last 15 years.

Specific Concerns:

Highways are a major concern for pronghorn in Unit 34B. Suitable pronghorn habitat within Unit 34B is separated from pronghorn habitat in adjacent units (34A, 35A, and 35B) by paved, fenced highways along the southern and western perimeters. Of greatest importance was the fragmentation of the Empire Cienega grassland from similar grassland in adjacent units. The lack of movements among units, combined with increased development, hindered seasonal pronghorn movements.

The majority of livestock fences in this unit are not game standard. Coordination with local ranchers, land managers, and permittees-landowners should be continued to determine which fences may be modified or removed to facilitate pronghorn travel.

A pressing issue for pronghorn in this unit in the past was the lack of year-round water sources in the grasslands. It appeared as though fawns and adults must typically travel long distances to reach water. Even though numerous potential water sources exist and several have been added, many are sometimes dry. Reduced water distribution limits areas for fawning, causing females to fawn in areas of lower quality fawning habitat in order to have access to available water. Concentrating pronghorn around few waters makes them vulnerable to predators and reduces the quality and quantity of available forage. Repairing existing water developments or constructing new ones and ensuring that water is available to pronghorn is necessary to improve the quality of the habitat in this unit. A map of water sources attributed with data on seasonal water levels would assist in the placement of new waters.

Tree and shrub encroachment is a major concern in Unit 34B, which has greatly reduced the size of the grasslands in this area. Many areas in Unit 34B have a moderate quality, grassland understory, but are heavily invaded by mesquite. Reducing the mesquite, through prescribed fires or mechanical means would enhance this area for pronghorn and provide additional grasslands for pronghorn; cattle ranching in the area would also benefit. If the mesquite were removed or reduced in the northcentral area (T17S, R19E), a corridor could be opened up between this area and the existing high quality grasslands making a much larger area of the unit suitable for pronghorn.

Ranchette-style housing developments have been and continued to be constructed in 3 major areas: along State Route 83 north of Sonoita, along State Route 82 east out of Sonoita, and along the western foothills of the Whetstone Mountains. Land has been parcelled for development in the grasslands areas, and if housing occurred, it would reduce the quantity of good quality

grasslands left. Development adds fences, roads, traffic, dogs, and other disturbances and dangers. While stopping development is not likely, encouraging orderly development, with smaller lots and requiring people to construct game standard fencing, if any, would lessen the impact to pronghorn already in the area.

Management Objectives:

- Maintain and enhance pronghorn habitat and travel corridors through cooperation with city and town governments, land management agencies, and private or other landowners.
- Evaluate and improve wildlife water distribution.
- The fences along both sides of SR 82, from east of the Upper Elgin Road turnoff west to Fort Canyon Wash, should be modified to game standard by replacing the bottom strand with a smooth wire placed >41-46 cm from the ground. Similarly, the same fence modifications should be made to the fences along State Route 83, from I-10 south to State Route 82. Evaluate and modify livestock fences to pronghorn specifications.
- Encourage non-governmental organizations, such as The Arizona Antelope Foundation and The Nature Conservancy, to participate in grassland conservation and management.
- Provide landowners information about conservation easements to protect grasslands from housing developments to maintain their ranching heritage.
- Cooperatively work with city and county planning and zoning departments to identify and mitigate the predicted isolation of pronghorn populations by roads and residential housing.
- Provide public information on viewing opportunities for pronghorn.
- All Public and state lease lands must maintain water sources year round. During drought conditions, water must be left in earthen tanks for wildlife.
- Any changes in public land grazing plans shall incorporate the annual and seasonal habitat requirements of pronghorn.
- Coordinate with landowners, organizations, and agencies to keep viable agriculture and livestock operations in place to avoid sale and subdivision.

Units 35A and 35B (San Rafael Valley)

History:

This native population was greatly reduced by 1920 and was subsequently supplemented with 13 northern Arizona antelope in 1945 and an additional 57 in 1951. In addition to these supplements, 72 and 18 northern antelope were released on Fort Huachuca Military Reservation in 1949 and 1951, respectively. Between 50-100 animals were consistently surveyed from the late 1950s to the late 1960s when the population declined and remained low for nearly a decade. From 1968 to 1977, an average of only 23 pronghorn were observed each year during surveys. In the late 1970s, the population slowly recovered to a level similar to the 1950s.

The San Rafael Valley was then opened to regulated hunting for the first time since 1913 as a separate block in the 1958-59 season with 5 firearm permits resulting in a harvest of 5 antelope bucks. The next year (1959), permits were increased to 15, then stayed between 6-10 until it was closed in 1972 because of concerns over low numbers of antelope observed. When the season reopened in 1979 and continues to this day with 10 archery and 2 muzzleloader permits. Firearm permits are no longer issued in this area because of the close proximity of housing and rural schools throughout the habitat occupied by these animals.

Population Information:

Along with the standard summer survey, a winter survey was conducted during February, 2007. This survey was flown only in the northern part of the units comprising the Sonoita-Elgin herd. A total of 59 pronghorn were observed, consisting of 12 bucks, 42 does, 4 fawns, and 1 unclassified. Ratios for this survey indicated 29 bucks: 100 does: 9 fawns. Of course the number of fawns observed during this time of year is not an accurate representation of survival since fawn identification is difficult due to average size of fawns being close to that of adult does.

Aerial surveys during August 2007 resulted in a total of 73 pronghorn being observed, consisting of 12 bucks, 43 does, and 18 fawns for a buck:doe:fawn ratio of 28:100:42. The total is below the 5-year average of 79, while groups of animals observed (11) are below the average (17). The buck ratio (28) increased from the 2006 figure of 25:100 and is below the 5-yr. mean of 33:100. The fawn ratio (42:100) increased from 2006 data of 18:100, and is above the mean of 18:100. It should be noted that during this survey period, a double-count technique was used. It is felt that due to a relatively high aircraft altitude during the flight overall pronghorn observation rate was diminished.

Prior to 2007, the 18-year average (1988-2006) indicates that surveyed buck numbers have undergone a continual decline, while long-term fawn survival for the population remains well below the long term average of 12 fawns. Over the same 18-year time span, the total number of does observed has averaged 55, which also is indicative of a declining pronghorn population. The current year reproduction along with above average fawn recruitment in 2005 (43:100) assisted in stabilizing the population.

Specific Concerns:

Fenced State Route 82 impedes pronghorn movements to the north onto the Empire Cienega in Unit 34B. Pronghorn would be more likely to cross this low to moderate-use highway if these fences were modified with a smooth bottom strand (41-46 cm above ground) and set further back from the roadway. The best area for pronghorn to cross this highway is just east of Sonoita, where reduced speed limits may be feasible. Additionally, fenced State Route 83 impedes pronghorn movements within this unit in the Babocomari grassland area and should also be modified to facilitate pronghorn movements.

The Elgin Road blocks the primary remaining corridor for pronghorn to access grasslands further south. This road is paved and fenced on both sides, with the bottom strands only centimeters from the ground. A short length of the fence has a smooth bottom strand, however, it is not long enough to substantially benefit pronghorn. Additionally, this area is adjacent to State Route 82, another pronghorn barrier, which further blocked movements.

State Route 92 in Miracle Valley is a barrier to pronghorn movements. If a population of pronghorn is reintroduced and managed in this area, then fence modifications would be necessary to permit free movement. Fenced State Route 82 prevents pronghorn movements from the Elgin area to the large block of Empire Cienega pronghorn habitat, in Unit 34B on the northern side of this highway. State Route 82 is a moderate-use highway, therefore, pronghorn movements would be facilitated if the fences along this highway were modified to game standard.

The combination of pavement and fences along the Elgin-Canelo Pass Road, from State Route 82 to Elgin, impeded pronghorn movements. The western and northern foothills of the Mustang Mountains has suitable pronghorn habitat, but the largest block is in Unit 35B, west of the road. Traffic along this road is low, hence, it may be possible to return this area to open rangeland. If not, fences along the road need to be modified.

The majority of livestock fences in this unit are not game standard. Fence modifications should be made in both of the major grasslands. The northern end of the San Rafael Valley contains some electric fences, but most fences are 4-5 strand, barbed wire. Fences that require attention includes the northern perimeter fence of the Babocomari. Additionally, a Savory grazing system along the western boundary of Fort Huachuca also hinders pronghorn movements.

The area where the northwestern end of the Fort Huachuca grassland met the Babocomari grassland would provide a suitable travel corridor; however, the woven-wire fence along the Fort's boundary blocked pronghorn movements. Livestock fences within the Fort are used to separate Game Management Areas and are not game standard. All of these fences should be replaced with a 2-strand, wire fence or a fence that exceeds game standards.

There are many waters in this unit for pronghorn to use. However, several of these waters are situated in washes and are surrounded by tall bunchgrasses, mesquite, and whitethorn acacia. These waters should be kept void of vegetation that subject watering pronghorn to ambush by predators. Additional year-round water sources should be installed on the Research Sanctuary and on the northern end of the West Range of Fort Huachuca. Existing waters at the southern end of the Fort should be cleared of surrounding, tall vegetation. Coordination with the landowners and land managers can determine which waters can be modified to improve access for pronghorn.

This is a major issue for managing pronghorn in Units 35A and 35B. Encroachment of trees from the Canelo Hills and Huachuca Mountains onto the grasslands below has eliminated pronghorn travel corridors to neighboring grasslands. These corridors, especially from the San Rafael Valley directly north to the western end of the Babocomari, should be opened up by cabling, chaining, fuel woodcuts, chemical treatments, and prescribed burns. Additionally, a corridor needs to be opened at the northeastern side of the Huachucas to permit pronghorn travel around the western side of the business-housing area of Fort Huachuca to the grasslands at the southern end of the Fort. Whitethorn acacia and tall yucca are choking out the remaining grassland in the Elgin area. Since the western end of the Elgin grassland is the only place connecting this grassland to others further south, we recommend aggressive removal of invasive shrubs using herbicides, chaining, or fire to prevent further encroachment and to open up existing shrub-invaded grasslands.

Oak and juniper trees invaded the 2 major grassland areas: Elgin-Babocomari and the San Rafael. The majority of trees present are old trees; thus, it did not appear that most of the encroachment is recent. Trees already separated the 2 grasslands (the northern from the southern) in this unit.

Additionally, the tall shrubs in the low wash areas of the Babocomari need to be reduced to improve visibility for pronghorn traveling through these areas. Coordination with landowners and land managers can determine which habitat mitigation features are most appropriate for each treatment area.

The eastern side of the Babocomari River on the Babocomari Land Grant is invaded by tall whitethorn acacia. Shrub removal in this area of the Babocomari would greatly benefit pronghorn, as well as livestock. Tall shrub and tree invasion is also occurring in the Bald Hill area, which has good potential for pronghorn. The tall shrubs and trees along the periphery of this area should be pushed back and kept from further encroachment onto grasslands.

Reduced species richness is likely the result of long-term livestock overuse and from fire suppression. Livestock grazing plans should be adjusted to be in harmony with local precipitation patterns. Much of these grasslands would benefit from burns to open up the under story, thereby permitting forb growth and the re-establishment of desirable perennial grasses and shrubs.

The whole western side of the San Pedro River drainage has been lost as pronghorn habitat, because of Sierra Vista, Fort Huachuca, and associated communities. Better planned development in the Sonoita-Elgin communities is required to prevent complete fragmentation of some of the best pronghorn habitat in the state.

Management Objectives:

- Work with landowners to ensure continued access to these areas to the greatest extent possible.
- Maintaining and enhancing pronghorn habitat and travel corridors through cooperation with city and town governments, land management agencies, and private or other landowners.
- Evaluate and improve wildlife water distribution.
- Identify and improve travel corridors to encourage interchange between herd units.
- Use of electric fences for future fence construction should be encouraged, because pronghorn can cross them easier than a 4-5 strand barbed-wire fence.
- Greater use of controlled burning to restore grassland habitat and increase plant species diversity.
- Provide landowners information about conservation easements to protect grasslands from housing developments to maintain their ranching heritage.
- Provide public information on viewing opportunities for pronghorn.
- Require developers to fund vegetation treatments (brush eradication) of area equal in size to area being lost, resulting in no net loss of pronghorn habitat.
- Avoid any additional fence construction, but if necessary, it should meet Department criteria to allow for pronghorn movement (wildlife specification fencing).
- Coordinate with landowners, organizations, and agencies to keep viable agriculture and livestock operations in place to avoid sale and subdivision.

Units 36A and 36B (Altar Valley)

History:

Pronghorn in this valley in the late 1880s disappeared in the early part of the 20th century. In 1945, 15 pronghorn from northern Arizona were transplanted near Arivaca with little success and then in 1987, 87 pronghorn were captured in Texas and released 2 miles south of the headquarters. In the first 6 weeks after the release at least 6 adult pronghorn were killed by coyotes. A year after the release only 50 pronghorn were seen on surveys. This population increased slowly to about 75 individuals. A total of 88 pronghorn were released in 2 locations in the Altar Valley on January 11, 2000. Half of those were released in the southern Altar Valley (Unit 36B). Forty-four (27M:13F) were taken to the release site near Round Hill Tank, 3 miles north of the Refuge headquarters (January 11, 2000). The success of this release was much lower than hoped for. More than half the animals were likely lost in the first few months.

Population Information:

Fawn survival has been low in this population. There have not been enough fawns born each spring to "swamp" the predators during the first few critical weeks after parturition. A few years of good fawn survival would probably boost the total population to a level that could withstand the present predation pressure on fawns.

In 1959, the only legal hunt in the Altar Valley since the statewide closure in 1913 was conducted. That year 10 permits were issued and 9 hunters harvested 2 antelope. That hunt was closed the next year and remains closed today.

Specific Concerns:

Water sources appear to be plentiful throughout Unit 36B, but pronghorn would have to travel through thick mesquite to get to most of them. Water sources on the Buenos Aires NWR (BANWR) are well distributed and accessible to pronghorn, but are dry most of the year due to inadequate runoff resulting from dense vegetation that could be removed by fire or other impacts to improve water flow. Telemetry locations of released pronghorn on the refuge revealed that pronghorn are found only near open water in the hot summer months. On the BANWR, Department pronghorn researchers reported that in the summer of 2001 only 3 of 30+ water sources had water due to the drought. There are additional water catchments planned for the BANWR in Units 36A and 36B.

Tree and shrub encroachment is the major problem that reduces the suitability this valley for pronghorn. Shrub-form mesquite has invaded the grasslands in this unit, leaving few open areas remaining. Long-term fire suppression and inappropriate grazing (historically) are likely causes of this invasion. Substantial habitat manipulations are necessary to prevent further invasion and restore historical grasslands. Mechanical treatment, chemical treatment, and repeated fires can be used to reduce these mesquite invasions, however, adult mesquites are resistant to fire and readily resprout. Aggressive and repetitive habitat management, employing multiple methods, should be used in the remnant grasslands to prevent mesquite invasion, increase the size of the remaining grasslands, provide corridors to other grasslands, and restore some historical grassland areas. Coordination with refuge personnel, permittees (outside of BANWR), and land managers should be used to develop a restoration plan.

Management Objectives

- Prescribed burns, chemical treatments, and mechanical treatments should be used in combination to remove or thin areas invaded by shrubs.
- Increase population to level where it will provide hunter harvest opportunity.
- Maintaining and enhancing pronghorn habitat and travel corridors through cooperation with the BANWR, other landowners and permittees.
- Evaluate and improve wildlife water distribution.
- Evaluate the few remaining livestock fences and modify to pronghorn specifications or remove (on the BANWR).
- Encourage local sportsman groups through information and education efforts to hunt predators at select times and locations to increase fawn survival.
- Assure the inclusion of pronghorn habitat needs and harvest opportunity in the BANWR Comprehensive Conservation Plan and Habitat Plan.
- Assure roads are not improved to the detriment of pronghorn (i.e., increased speeds resulting in collision mortality).
- Encourage non-governmental organizations, such as The Arizona Antelope Foundation and The Nature Conservancy, to participate in grassland conservation and management.
- Provide public information on viewing opportunities for pronghorn.

REGION VI

Unit 21 Herd

Background:

Unit 21 is located in central Arizona just north of Phoenix and encompasses 3,098 km² of mainly rugged terrain. The unit is defined as follows: Beginning on I-17 at the Verde River; southerly on the southbound lane of I-17 to the New River Road (Exit 232); east on New River Road to Fig Springs Road; northeasterly on Fig Springs Road to the Tonto National Forest boundary; southeasterly along this boundary to the Verde River; north along the Verde River to I-17.

Habitat Description:

Major landscape features in Unit 21 are: (1) Pine Mountain; (2) New River Mountains; (3) Agua Fria River drainage; (4) the southern end of the Black Hills, which forms an escarpment along the Verde River; and (5) the Perry Mesa grasslands. Terrain is broken and rocky throughout most of the unit. Pine Mountain is the highest point in the unit at 2,077m. A small ponderosa pine-oak forest occurs on top of Pine Mountain, but the area is predominately pinyon-juniper woodland. The lowest elevation occurs along I-17 at Carefree Highway (<650 m), which is a creosote flat.

The Bloody Basin Road (N-S) and Dugas Road (E-W) bisect Unit 21 pronghorn habitat. Numerous paved roads occur in the Carefree-Cave Creek and New River areas. New River, Black Canyon City, and Cordes Junction occur on the western edge of the unit. Camp Verde occurs along the northern boundary. Phoenix lies along the southern boundary. Sub-divisions expanding from Phoenix occur within the unit along Carefree Highway. No communities exist within the interior of the unit, although the town of Cordes Junction is expanding along the central –western edge of the unit, and a possible new development is projected west of Dugas.

Landownership in Unit 21 includes Prescott National Forest in the northern portion and Tonto National Forest in the central portion and southeastern corner. BLM lands occur near the Dugas Road south to Black Canyon City, and State Trust lands occur south of Black Canyon City and around Cordes Junction. Private in-holdings occur primarily along Sycamore Creek and within the Agua Fria drainage.

About 600 km² of Unit 21 is suitable pronghorn habitat composed of semidesert grassland arranged in two substantial areas of moderate – high quality habitat. One of these is the Perry Mesa area, within the Agua Fria National Monument, (the “south study area”), and the other is composed of complexes of mesa and basins farther north, including Yellowjacket, Cottonwood and Marlow Mesas; East Pasture; the Cedar Mill-Reimer Draw-Hooker Basin area, and other patches.

The Unit 21 pronghorn herd continues to move between the northern and southern portions of the unit despite developmental encroachment into what is considered the western travel corridor through the unit and tree and shrub encroachment in many areas. Movement through these barriers results in risks due to predation and human disturbance.

Habitat quality	No. of sections	Km ²	% of Unit
High	9	22.9	0.7
Moderate	103	245.8	7.9
Low	144	353.1	11.4
Poor or unsuitable	102	209.2	6.8

Recently pronghorn survey numbers have reflected an upward trend in total animals, and groups observed, and buck and fawn ratios. The fawn ratio peaked in 2004 at 54:100, and the fawn ratio was 38:100 in 2005, 44:100 in 2006, and 64:100 in 2007.

Beginning in May of 2002, Region VI conducted monthly fixed-wing surveys to document pronghorn distribution along with locations of pronghorn in relationship to water throughout Unit 21. These continued through August 2004 and then were reduced to four flights per year at the most significant periods of the annual cycle.

Preliminary results from data since the 2000 survey in Unit 21 indicate that the concentration of pronghorn may have shifted from the northern half of the unit to the southern half of the unit during recent years. Further there appears to be disparity between fawn recruitment in the north versus the south. The data suggests that fawn recruitment responds to these differences, with higher levels of fawn recruitment in southern areas, which have more optimal hiding cover, less livestock use and differing land management ownership.

One of the unexpected benefits of these flights is a minimum population estimate based on the consistency of total animals observed month to month. Pronghorn herd in larger groups during winter months making locations of pronghorn easier to detect during monitoring flights. The winter maximum number of pronghorn observed was 140 during November 2002, 138 during winter of 2003, 172 during winter of 2004, and 165 during winter of 2005. This minimum population estimate should be close to the actual population size based on pronghorn herding behavior, tendency of herds to remain in the same areas, and ease of location by observers due to larger pronghorn group sizes. During August 2006 a simultaneous double-count was conducted for pronghorn in Unit 21, with a population estimate ($n = 256$) that exceeds the largest total count from recent years by about 47%. The simultaneous double count for 2007 yielded a slightly lower estimate of 212. This is comparable to our actual observed winter count of 205.

Management Concerns:

Interstate 17 separates pronghorn in Unit 21 from those in Unit 19A in the Orme Ranch area and in Unit 20A in the Cordes area. Further, a small area of suitable habitat occurs in the highway median just north of the Dugas-Orme Ranch interchange. It is unlikely that any modifications to highway fences can be accomplished to mitigate these impacts. No bridge along this route appears large and open enough for pronghorn to pass under. The bridge at the Agua Fria River has some chance as a passage between Units 19A and 21, if the mesquite and catclaw thickets on both sides are cleared and the slopes lessened by grading. Because Unit 21 is basically a closed system for pronghorns, it is essential to maintain open rangeland along the Dugas Road and the improved, dirt Bloody Basin Road so pronghorn continue to move across them. Fencing along these roads should exceed game standards to permit easy movement across the roadbed. Bottom smooth wire greater than 46 cm above should be used

Numerous livestock fences occur in Unit 21. Most are barbed-wire fences that do not meet wildlife standards. A GIS database and map of fences and natural barriers has been developed for Unit 21. Results from a fence quality inventory conducted in 2004-2005 were archived in that database. Data indicates only 33% of fences within Unit 21 pronghorn habitat meet or come close to meeting wildlife standards (pers communication D. Warnecke, AGFD). Some have been modified to meet game standards and some electric fences occur in the East Pasture area. Additional fences need to be modified and heightened by removing or replacing the bottom barbed wire strands with a smooth wire 41-46 cm above ground. All interior allotment fences should be modified as a minimum mitigation feature. Coordination with permittees and land manager should determine if any fences can be removed and still maintain adequate livestock control. Fences along the movement corridors between East Pasture and Cordes Junction, and Black Mesa, and between the Dugas area and Perry Mesa should be priorities for removal.

Water availability is adequate in Unit 21, if water sources are maintained functional year round. Fencing around all tanks, especially those on Perry Mesa, needs to be removed, modified to exceed game standards, or wildlife friendly troughs at ground level need to be placed outside the corrals. Brush around the waters needs to be removed throughout the unit.

A GIS cover of water sources was developed for Unit 21. This needs to be updated with seasonal water availability, and it should be used as a tool for monitoring and maintaining water availability. Using buffers around waters with known availability, placement of new waters or identifying old waters to modify for year-round availability can be easily accomplished.

This is of major concern and negatively affecting pronghorn habitat quality in Unit 21. Junipers, prickly pear, shrub form mesquite, and catclaw have invaded many grassland areas. Shrub encroachment within movement corridors between the northern and southern portions of Unit 21 have reduced visibility and make them less suitable for pronghorn movement. Tree thinning and prescribed fire is practical for juniper control, but catclaw and mesquite are not effectively root-killed with these methods. Herbicides may be necessary to thin catclaw and mesquite dominated grasslands. Cabling, chaining, and pushing may thin numbers, particularly if prescribed fire follows the initial treatment.

Mesa tops in Unit 21 are dominated by tobosa grasslands found on deep, cobbly, silty clay loam soils. These soils typically support low plant species diversity. However, there are intrusions of alternate soil types adjacent and within these mesas that support higher plant species diversity. Plant species diversity and richness is affected by prolonged grazing disturbance, fire suppression, and precipitation. These factors have contributed to increases of exotic annuals, snakeweed and prickly pear across these semi-desert grasslands.

Unit 21 is near the Phoenix metroplex, and considerable recreational traffic occurs during all but the summer months. Major access routes include Bloody Basin Road, Dugas Road, and Forest Road 677 (a segment of the Great Western Trail). Visitation and commercial tours are expected to increase on the Perry Mesa and Black Mesa pronghorn habitats as a result of future archaeological interpretative development within the Agua Fria National Monument (about 40% of the Unit 21 pronghorn habitat is within the monument). Vehicular access in the north on

Dugas Road is expected to increase as private lands along Sycamore Creek are subdivided and developed. Dugas Road also provides access to the Pine Mountain Wilderness and realignment of the road away from the middle of the mesa tops east of the junction with Forest Road 677 may help reduce disturbance to pronghorn.

Controlling access to key fawning areas during fawning season (March-May) may be needed to improve fawn survival. Closure of non-system roads and numerous OHV trails may be required to protect and maintain pronghorn habitat.

Cordes Junction development has resulted in the loss of habitat for pronghorn in Unit 21. Further, it has affected seasonal movements between East Pasture and Black Mesa. Increased development in this area would result in additional loss of grassland habitat, something the small herds in Unit 21 may not be able to recover from. The second area of development seriously impacting pronghorn in Unit 21 is the Sunset Point Interchange. The best movement corridor to Black Mesa was lost to this development. Further development on the east side of I-17 at Sunset Point or Badger Springs could result in permanent separation of Black Mesa from the rest of the unit. Clearing and widening the gas line just east of I-17 may mitigate some of the impact. Future I-17 expansion or realignment could further fragment suitable pronghorn habitat. The potential for development of private lands along Sycamore Creek and the Agua Fria River is increasing. Private land along Sycamore Creek was targeted for development in 2005 however the water needed for the proposed housing development was not available. Developer plans are still pending for a housing project at a smaller scale. Development of private land inholdings within National Forest and BLM lands have the potential to fragment core habitats in the north and south and negatively affect pronghorn movement corridors between them.

Mountain lion predation was documented on nine of 28 radio-collared adult pronghorn (32%) in Unit 21 over a four-year period between 1989 and 1992. Mountain lion predation reduced adult pronghorn survival rates in rugged terrain and most predation occurred less than 1000 meters from canyon edges. One water source for pronghorn within a canyon drainage was a point source for predation by lions. By providing an alternative water catchment away from the canyon drainage, further lion predation on pronghorn at the water source may have been prevented or reduced.

Coyotes occur in the pronghorn habitat of Unit 21. The densities of coyotes in the area are unknown. Coyotes can be detrimental to recruitment of fawns into a pronghorn population, especially if adequate hiding cover for fawns is not available. Fawn hiding cover assessments conducted during three spring fawning seasons (2002–2004) indicated more hiding cover was available in the south versus the north pronghorn habitat. The Department surveyed a greater number of fawns per 100 does in the south during the spring fawning seasons from 2002–2005 and late-summer fawn survival indices (fawn:100 does) met or exceeded the Department's species management guidelines of 30–40 fawns per 100 does 3 out of 4 years in the south. Investigators concluded that more optimum hiding cover in the south may have positively influenced fawn recruitment.

In the spring 2005, the Department initiated a three year plan for coyote control within Unit 21 pronghorn habitat. Aerial gunning efforts are summarized in the following table. A decision

was made after this three-year effort to discontinue further aerial gunning efforts. Use of aerial gunning to improve pronghorn fawn recruitment through predator management should be considered when fawn ratios remain below 30:100 for two consecutive years that are followed by above average winter precipitation for the months of October through March and minimum hiding cover is available for fawns. If winter precipitation is favorable and a minimum eight inch stubble height is available in pronghorn fawning areas then April-May aerial gunning of coyotes should have a beneficial response to the fawn recruitment.

Year	Coyotes Removed In April	Coyotes Removed In May	Total Coyotes Removed
2005	19	5	24
2006	9	3	12
2007	3	12	15

The Department has coordinated with the land management agencies (BLM, Tonto NF, and Prescott NF), the Aqua Fria Grasslands Coalition and the Arizona Antelope Foundation to improve habitat conditions through various projects within Unit 21. Projects have included fence modifications to wildlife standards, fence removals, water developments, development of broad scale grassland maintenance burns, and juniper cuts. Habitat assessments and various research efforts have continued to focus on identifying pronghorn needs and developing management recommendations. Department concerns with allotment management have been expressed to land management agencies over the last 20 years.

Management Objectives:

- Obtain a pronghorn summer survey observation of 250+ animals to compare with observed pronghorn numbers during the period of 1985-1990 (mean = 268).
- Implement management strategies that improve and maintain fawn:doe recruitment to consistent levels between north and south herds that meet Department management guidelines.
- Collaborate with land management agencies and other stakeholders to develop landscape scale management plans that address management issues; maintain or improve grassland habitat quality; and influence pronghorn distribution patterns similar to historic records.
- Coordinate with land management agencies and stakeholders to improve the availability of forage and cover and mitigate drought impacts on pronghorn habitat quality.
 - Review environmental assessments developed for the renewal of grazing permits (NEPA process) and develop recommendations to mitigate impacts to pronghorn habitat quality. Document issues and concerns with allotment management and provide feedback to appropriate land managers for their consideration when developing annual operating instructions (adaptive management).
 - Conduct periodic habitat assessments to evaluate fawn hiding cover, forage availability, canopy cover, grassland vegetative composition and diversity, and water availability.

- Develop a landscape scale plan to maintain and restore pronghorn habitat connectivity and quality across central Arizona and within Unit 21 grassland habitat. Participate in the development of the Central Arizona Coordinated Pronghorn Management Plan and continue collaboration within the Unit 21 Pronghorn Workgroup to implement plans. Expand the Unit 21 Pronghorn Workgroup to include the Tonto National Forest and BLM.
 - Initiate Adopt-a-Ranch partnerships where needed to facilitate habitat improvement projects.
 - Improve relations with permitted livestock operators. Collaborate on habitat improvement projects that benefit pronghorn and livestock rangelands.
- Fund and implement habitat improvement projects to reduce tree and shrub encroachment in Unit 21 pronghorn habitats.
 - Task the Unit 21 Pronghorn Workgroup to develop site specific treatment priorities and methods consistent with direction in the forthcoming Central Arizona Coordinated Pronghorn Management Plan.
 - Prioritize treatments for movement corridors and core habitat areas.
 - Collaborate with land management agencies to support completion of required environmental analyses (NEPA and ESA) for project implementation.
 - Collaborate with livestock operators to develop partnerships and commitment to project goals, objectives and strategies.
 - Pursue funding for ongoing project implementation through annual funding sources, project match from federal or state land management partners, and/or project match from livestock operators.
 - Complete ongoing juniper thinning targets for the Sycamore Mesa project area currently funded at \$50,000 for FY 2006-2007.
 - Implement juniper thinning projects currently funded for FY2007-2008 and 2008-2009 on Prescott National Forest land.
- Continue current monitoring of pronghorn recruitment, distribution and population trends.
 - Continue fawning season (April and May), late-summer and fall aerial surveys to determine if the disparity in fawn recruitment between north and south disappears when habitat quality improves. Secondly, continue surveys to determine if pronghorn distribution expands or contracts with respect to historic range within Unit 21 as habitat improvement projects are completed or habitat quality changes in core habitat areas. Thirdly, continue to closely monitor fawn recruitment in response to coyote control.
 - Develop a monitoring strategy to verify if pronghorn respond favorably to habitat improvements designed to enhance suitability of movement corridors and reduce tree and shrub densities in core habitat areas.
- Reduce fence densities and improve fence quality to wildlife standards conducive for pronghorn movement.

- Use the Unit 21 GIS based fence quality inventory data (see map) to prioritize fence improvement projects in an efficient approach that maximizes collaboration between volunteer efforts and contracted work.
 - Prioritize annual work projects with volunteers in areas conducive to easy access.
 - Develop proposal to fund fence modifications of all fence segments inventoried as moderate, low, poor or unsuitable in the Unit 21 fence quality inventory and pursue funding FY 2007-2008.
 - Track fence improvement projects and update GIS based fence quality inventory map for ongoing planning.
 - Develop recommendations to reduce fence densities and pursue removal of fences identified as unnecessary for livestock operations and/or in such a state of disrepair as to create an entrapment hazard for wildlife.
- Reduce habitat fragmentation between north and south Unit 21 core habitats and between Units 21, 19A, and 20A.
 - Use heritage funds or other funding and partnerships to acquire private lands targeted for development along the Sycamore Creek, Agua Fria River, or State lands identified for auction.
 - Pursue conservation easements where possible within core habitats and movement corridors.
 - Support and pursue the Horseshoe Ranch land exchange proposal.
 - Pursue mitigation associated with future I-17 alignment and expansion projects to reconnect pronghorn habitat between Units 21, 19A, and 20A and prevent habitat fragmentation of Black Mesa.
- Conduct water distribution analysis and monitoring to facilitate the maintenance or improvement of water availability.
 - Locate and map all suitable waters for pronghorn use in Unit 21. Develop a GIS based map to facilitate annual monitoring efforts to identify locations that need management action.
 - Coordinate with land management agencies and livestock operations to maintain water availability.
 - Develop cost-share agreements to redevelop or enhance existing waters.
 - Implement management actions to improve population trends and protect long-term viability when needed.
 - Apply aerial gunning coyote control to key fawning areas the following year if the three year average observed fawn ratio for the unit drops below Department Guidelines of 30:100.
 - Consider harvest objectives for mountain lions in Unit 21 West if the total observed pronghorn drops below 75 during the summer survey for two consecutive years.
 - Conduct pronghorn transplants when habitat quality and precipitation levels are optimum.